National Park Service
U.S. Department of the Interior

North Cascades National Park Service Complex

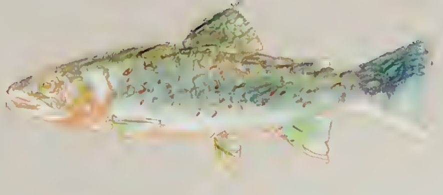
PARK UNIT SHELVES

NOCA

NORTH CASCADES NATIONAL PARK SERVICE COMPLEX

Mountain Lakes Fishery Management Plan

Draft



Environmental Impact Statement

NATIONAL PARK SERVICE
WATER RESOURCES DIVISION
FORT COLLINS, COLORADO
RESOURCE ROOM PROPERTY

VOLUME TWO / APPENDIXES

MAY 2005

How to Comment on this Document

Comments on this *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS) are welcome. If you wish to respond to the information contained in this document, you may submit your comments by any one of several methods. It is important to note that all comments must be postmarked, transmitted, or logged no later than 90 days from the date the U.S. Environmental Protection Agency filing notice is published in the *Federal Register*. This deadline will be posted on the North Cascades National Park Service Complex website at http://www.nps.gov/noca/highlakes.htm and will be published in a press release in local and regional newspapers. Written comments can be mailed to

Bill Paleck, Superintendent
Mountain Lakes Fishery Management Plan/EIS
North Cascades National Park Service Complex
810 State Route 20
Sedro-Woolley, WA 98284-1239

Reviewers are encouraged to submit comments, ideas, or questions online at the National Park Service Planning, Environment, and Public Comment (PEPC) website (http://parkplanning.nps.gov/noca). Once at the website, click on the "Mountain Lakes Fishery Management Plan/EIS" link, then click on "Documents and Links," then click on the "Draft Mountain Lakes Fishery Management Plan/EIS" link—this will bring up the draft plan/EIS and a link to an online comment form.

You may hand deliver comments at one of the several public meetings to be announced in the media following release of this document. Meeting details will be posted on the project website listed above. Comments can be hand delivered to the North Cascades Complex headquarters in Sedro-Woolley (810 State Route 20). Comments can also be faxed to 360.856.1934, attention: Mountain Lakes Fishery Management Plan/EIS.

We may not consider anonymous comments. However, individual respondents may request that we withhold their address from the decision-making record, which we will honor to the extent allowable by law. There also may be circumstances in which we would withhold from the record a respondent's identity, as allowable by law. If you wish us to withhold your name and/or address, you must state this prominently at the beginning of your comment.

UNITED STATES DEPARTMENT OF THE INTERIOR
NATIONAL PARK SERVICE

DRAFT MOUNTAIN LAKES FISHERY MANAGEMENT PLAN / ENVIRONMENTAL IMPACT STATEMENT

North Cascades National Park Service Complex, Washington

Lead Agency: National Park Service (NPS), U.S. Department of the Interior
Cooperating Agency: Washington Department of Fish and Wildlife (WDFW)

This *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS) evaluates a range of alternatives and management actions for 91 naturally formed mountain lakes in the North Cascades National Park Service Complex (North Cascades Complex) that currently have, or at one time had, a fish presence as a result of either documented or undocumented fish stocking activities. Under natural conditions, these 91 mountain lakes would be fishless, but available records indicate these lakes have either been stocked in the past or are stocked now. This plan/EIS assesses impacts that could result from continuation of the current management framework (the no-action alternative) or from implementation of any of the three proposed action alternatives. The purpose of the fishery management plan is to guide future actions by the NPS and WDFW that would conserve native biological integrity; provide a spectrum of recreational opportunities and visitor experiences, including sport fishing; and resolve the long-standing debate and conflicts over fish stocking in the 91 naturally fishless mountain lakes in the North Cascades Complex. Upon conclusion of the plan/EIS and decision-making process, one of the four alternatives would become the "Mountain Lakes Fishery Management Plan" and guide future actions for a period of 15 years.

Alternative A—No Action, Existing Management Framework of 91 Lakes (62 Lakes Have Fish). No new management actions were applied. This alternative assumes that the existing management decisions, without any new criteria or factors, would continue.

Alternative B, Proposed Adaptive Management of 91 Lakes under a New Framework (42 Lakes May Have Fish) (Preferred Alternative). The proposed management framework would be to eliminate high densities of reproducing fish populations from lakes while allowing low densities of reproducing and nonreproducing fish populations in select lakes. After monitoring or evaluation, restocking of nonreproducing fish would be allowed in certain lakes only if impacts on biological resources could be minimized. Lakes that are currently fishless would remain fishless. The possible future outcome would be that recreational fishing opportunities may occur in up to 42 lakes.

Alternative C, Proposed Adaptive Management of 91 Lakes under a New Framework (11 National Recreation Area Lakes May Have Fish). The proposed management framework would be to eliminate high densities of reproducing fish populations from lakes while allowing low densities of reproducing and nonreproducing fish populations in select lakes in the Ross Lake and Lake Chelan National Recreation Areas (NRA) and to maintain currently fishless NRA lakes as fishless. The possible future outcome would be that 11 NRA lakes may have fish and 11 would be fishless, and 69 national park lakes would either remain fishless or become fishless over time.

Alternative D, 91 Lakes Would Be Fishless (Environmentally Preferred Alternative). The emphasis of this alternative would be to eliminate all fish from the mountain lakes in the study area. Currently, 62 of the 91 lakes have fish, 29 lakes are fishless.

The review period for this document will end 90 days after the U.S. Environmental Protection Agency has accepted this document and published a "Notice of Availability" in the *Federal Register*. All review comments must be received by that time and addressed to

Bill Paleck, Superintendent
Mountain Lakes Fishery Management Plan/EIS
North Cascades National Park Service Complex
810 State Route 20
Sedro-Woolley, WA 98284-1239

NATIONAL PARK SERVICE
WATER RESOURCES DIVISION
FORT COLLINS, COLORADO
RESOURCE ROOM PROPERTY

For further information, write the above address or call the superintendent's assistant at 360.856.5700, ext 351.

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National Park Service
U.S. Department of the Interior

North Cascades National Park Service Complex

North Cascades National Park Service Complex

DRAFT

Mountain Lakes Fishery Management Plan Environmental Impact Statement

Volume Two / Appendixes

May 2005

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Canada
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Sauk River
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Darrington
Boulder River Wilderness
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Appendix A

1985 MEMORANDUM OF UNDERSTANDING,
1986 MEMORANDUM (POLICY WAIVER)
FROM WILLIAM MOTT, JR.,
1988 SUPPLEMENTAL AGREEMENT,
AND 1991 CONSENT DECREE

APPENDIX A:

1985 MEMORANDUM OF UNDERSTANDING,

1986 MEMORANDUM (POLICY WAIVER) FROM WILLIAM MOTT, JR.,

1988 SUPPLEMENTAL AGREEMENT,

AND

1991 CONSENT DECREE

Agreement No. MU-9000-5-0004

MEMORANDUM OF UNDERSTANDING
Between

National Park Service
and
State of Washington Department of Game

Article I. Background and Objectives

This Memorandum of Understanding is between the State of Washington Department of Game, acting through and by the Director, hereinafter referred to as the Department, and the National Park Service acting by and through the Regional Director of the Pacific Northwest Region, hereinafter referred to as the Service. Both the Department and the Service recognize a mutual concern and responsibility for the fisheries and wildlife resources found within the State and desire to cooperate for the protection and enhancement of such resources.

The purpose of this Memorandum of Understanding is to continue cooperative efforts in the management, protection, and enhancement of the fisheries and wildlife resources of mutual concern.

The general authority for this cooperation is contained within the National Park Legislative Authority:
16 USC, Chapter 1, Section 1a-1;
  Chapter 5A, Sub-chapter I, Section 661;
  Chapter 5B, Sec. 669;
  Chapter 10B, Section 777.
43 CFR, Section 24.6.

Article II. Statements of Work

Recognizing a mutual concern and responsibility for the fisheries and wildlife resources found within the state of Washington:

A. The Service agrees:

1. To consult with the Department prior to initiating research projects or implementing plans, programs, or regulations affecting fish and wildlife species distribution, numbers or public use of fish and wildlife found within areas administered by the Service.

2. To practice those forms of management which will benefit fish and wildlife, and their habitats, and to maintain or restore their natural and historic distribution and abundance, consistent with the respective Service policies and park objectives.

3. To permit the harvest of fish and wildlife in accordance with applicable state laws and regulations of the Department in those areas under the jurisdiction of the Service which are open to hunting and/or fishing. It is recognized that some park regulations may vary for management purposes.

B. The Department agrees:

1. To consult with the Service before establishing or implementing research and management programs pertaining to fish and wildlife that may affect public use or other natural resources of the area administered by the Service.

2. To assist the Service in the maintenance or restoration of mutually-agreed-upon distribution and abundance of game fish and wildlife populations in Service areas, including the removal of excess animals by means that are consistent with Service and Department policies and objectives, subject to the provisions of paragraph C.1., below.

C. The Department and the Service mutually agree:

1. To consult concerning any proposals to transplant fish and wildlife to or from national parks within the state of Washington, and that any such transplants shall be by mutual agreement prior to any action by either the Service or the Department; the Department will provide the necessary coordination with other states, provinces, institutions, or other organizations, and for the disposition of wildlife transplanted from parks to other areas.

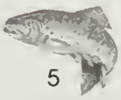
2. To establish Technical Study Task Forces composed of biologists, wildlife managers, and other professionals of both agencies, to resolve regional fish and wildlife problems and develop recommendations for long-range and annual fish and wildlife programs as needs are mutually identified,

3. To meet jointly at least annually to consider recommendations of the Technical Study Task Forces and other subjects of mutual interest. The Department will host meetings in odd-numbered years; the Service in even-numbered years.

4. To cooperate in joint enforcement of applicable game and/or fish laws and regulations relative to lands and waters administered by the Service, consistent with jurisdictions possessed by the Department and the Service.

5. To encourage the joint publication of press releases and the interchanges between parties of all pertinent agency policies and objectives, plans, statutes, rules and regulations, and other information as required for the wise use and perpetuation of regional fish, wildlife, and park resources.

6. To enter into working agreements as occasion demands for the use of lands, buildings, and other facilities owned and operated by either party hereto, for special projects.



7. To enter into supplemental agreements to this Memorandum of Understanding as necessary to carry out joint programs in the individual units administered by the Service.

8. That each and every provision of the Memorandum of Understanding is subject to the laws of the United States and the laws of the state of Washington and to the delegated authority in each instance.

9. That nothing in this Memorandum of Understanding shall be construed as obligating either party hereto to the expenditure of funds or for the future payment of money in excess of appropriations authorized by law.

10. That nothing contained herein shall be construed as limiting the responsibility and authority, as defined by law, of the Regional Director, National Park Service, and the Director, Washington Department of Game, in connection with the administration and protection of lands and resources under their respective administrations.

Article III. Term of Agreement

1. This Memorandum of Understanding supersedes all existing agreements between the Pacific Northwest Region of the National Park Service and the State of Washington, Department of Game, regarding cooperative efforts in the management, protection, and enhancement of the fisheries and wildlife resources of mutual concern.

2. This Understanding is effective on the date last shown on the signature page, and will remain in effect for five years from the date at which time it shall be reviewed to determine whether it shall be renewed, modified, or terminated. This agreement shall expire at the end of the specified term unless formally reaffirmed or rewritten if necessary. Amendments to this Memorandum of Understanding may be proposed by either party and shall become effective upon written approval by both parties.

Article IV. Key Officials

1. Key State of Washington Official:

   Director, State of Washington Department of Game
   600 North Capitol Way
   Olympia, Washington 98504

2. Key National Park Service Official:

   Regional Director, Pacific Northwest Region
   National Park Service
   Westin Building, Room 1920
   2001 Sixth Avenue
   Seattle, Washington 98121

Article V. Termination

This Memorandum of Understanding shall remain in full force and effect unless cancelled by either party upon a written six (6)-month notice to the other party.

Article VI. Required Clauses

1. During the performance of this Agreement the participants agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex, or national origin.

2. No member or delegate to Congress, or resident Commissioner, shall be admitted to any share or part of this Agreement, or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Agreement if made with a corporation for its general benefit.

In witness whereof, the parties hereto have executed this Memorandum:

APPROVED AS TO FORM:

Assistant Attorney General for
Washington State

National Park Service
Pacific Northwest Region
Seattle, Washington

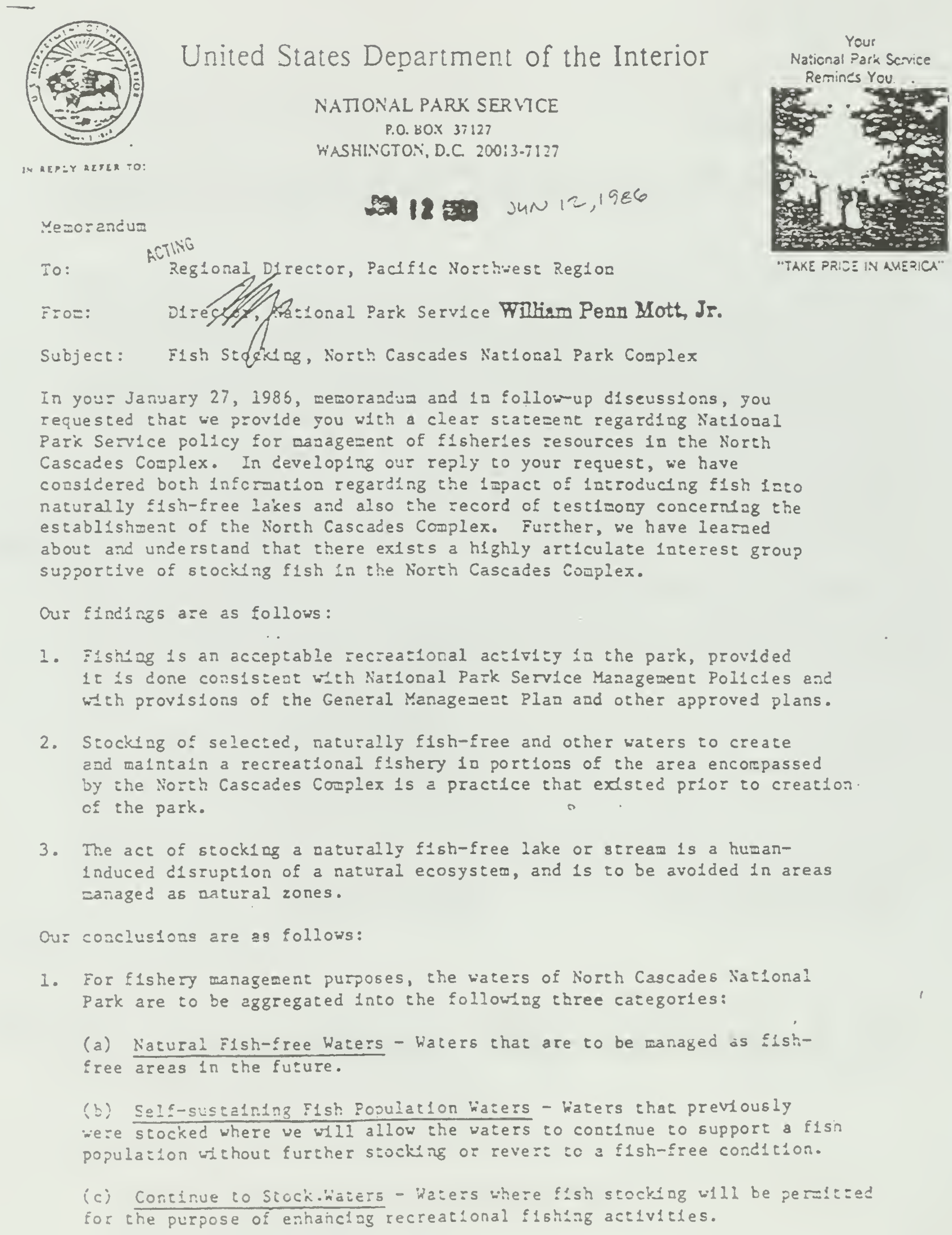
State of Washington
Department of Game
Olympia, Washington

Regional Director

7/8/85
Date

Jack H Wayland
Director

AUG 15 1985
Date



United States Department of the Interior

NATIONAL PARK SERVICE
P.O. BOX 37127
WASHINGTON, D.C. 20013-7127

IN REPLY REFER TO:

Your
National Park Service
Reminds You. . .

"TAKE PRIDE IN AMERICA"

12 JUN 12, 1986

Memorandum

To: ACTING Regional Director, Pacific Northwest Region

From: Director, National Park Service **William Penn Mott, Jr.**

Subject: Fish Stocking, North Cascades National Park Complex

In your January 27, 1986, memorandum and in follow-up discussions, you requested that we provide you with a clear statement regarding National Park Service policy for management of fisheries resources in the North Cascades Complex. In developing our reply to your request, we have considered both information regarding the impact of introducing fish into naturally fish-free lakes and also the record of testimony concerning the establishment of the North Cascades Complex. Further, we have learned about and understand that there exists a highly articulate interest group supportive of stocking fish in the North Cascades Complex.

Our findings are as follows:

1. Fishing is an acceptable recreational activity in the park, provided it is done consistent with National Park Service Management Policies and with provisions of the General Management Plan and other approved plans.

2. Stocking of selected, naturally fish-free and other waters to create and maintain a recreational fishery in portions of the area encompassed by the North Cascades Complex is a practice that existed prior to creation of the park.

3. The act of stocking a naturally fish-free lake or stream is a human-induced disruption of a natural ecosystem, and is to be avoided in areas managed as natural zones.

Our conclusions are as follows:

1. For fishery management purposes, the waters of North Cascades National Park are to be aggregated into the following three categories:

   (a) Natural Fish-free Waters - Waters that are to be managed as fish-free areas in the future.

   (b) Self-sustaining Fish Population Waters - Waters that previously were stocked where we will allow the waters to continue to support a fish population without further stocking or revert to a fish-free condition.

   (c) Continue to Stock Waters - Waters where fish stocking will be permitted for the purpose of enhancing recreational fishing activities.

2. All waters in North Cascades National Park that presently have no fish are not to be stocked with any kind of fish.

3. Park waters that are potential candidates for continued fish-stocking are to be reviewed to determine which waters warrant management as an enhanced recreational fishery, and for which continued fish-stocking is to be an acceptable action.

4. Those waters within the park that specifically are selected to be managed as enhanced recreational fishery waters are the only waters that may be stocked now or in the future. Fish stocking of these waters should be done only with fish species that are native to the park waters, if such species exist. If no native species exist, stocking should be limited to fish species that are native to the ecological region within which the park is found. However, use of such ecologically related non-native fish species must be restricted so that these species do not become established in natural zone waters in the park.

In summary, with the three above classes of waters (fish-free waters, self-sustaining fish population waters, and fish-stocked waters) we will provide for an enhanced recreational fishing experience in the park while at the same time assuring that we provide the opportunity for aquatic research under natural conditions. In this regard, it would be desirable for your office to develop ~~and implement~~ a research effort that (a) establishes current fish and aquatic habitat baseline conditions in park waters; (b) monitors carefully the impacts of this fish-stocking guidance on fish and other wildlife; and (c) determines changes over time referenced against current baseline conditions or against undisturbed natural conditions where they are known. These data will help provide an informed basis for determining whether changes in our fish-stocking management actions may be needed in the future.

SUPPLEMENTAL AGREEMENT
to

MEMORANDUM OF UNDERSTANDING
Between

National Park Service
and
State of Washington Department of Game (now Wildlife)

Article I. Background and Objectives

This Supplemental Agreement supplements the Memorandum of Understanding, Agreement No. MU-9000-5-0004 which was entered into between the Department of Game (now Wildlife) and the Pacific Northwest Region of the National Park Service, dated August 15, 1985, hereinafter referred to as the MOU. This Supplemental Agreement is between the Washington State Department of Wildlife (previously Game), acting through and by the Director, hereinafter referred to as the Department, and the National Park Service acting by and through the Regional Director of the Pacific Northwest Region, hereinafter referred to as the Service.

The purpose of this Supplemental Agreement is to establish a mutually agreed to list of lakes within the boundaries of North Cascades National Park which the Department will stock with fish as part of its fish management program.

Article II. Statements of Work

Recognizing the need to establish mutually agreed upon policy relating to fish stocking in lakes within North Cascades National Park and in keeping with Article II C 1 and 7 of the MOU, the Department and the Service mutually agree:

1. The Department shall be allowed to stock fish and/or provide fish for stocking in 40 lakes within the boundaries of North Cascades National Park as part of the Department's fish management program. These 40 lakes shall consist of those lakes previously agreed to by the Department and the Sevrice as lakes currently being stocked (17), and lakes with self-sustaining populations (23). These are 40 of the lakes within North Cascades National Park which the Department and Service agree have been previously stocked. The 40 lakes that may be stocked are identified as such on Appendix A, which is attached hereto and incorporated herein by this reference.

2. Additions or deletions to the list of 40 lakes may be made only by mutual agreement of the Department and the Service. Research results will be considered in future decisions.

3. The Department shall, in consultation with the Service, provide annual plans to stock fish including number and species of fish, specific lakes, and the stocking frequency of each lake.

Article III. Term of Agreement

1. If the MOU expires or terminates, the parties intend that this Supplemental Agreement shall survive the termination of the MOU and shall continue in effect until terminated as provided herein.

2. This Supplemental Agreement shall first be subject to mutual review and evaluation by July 2000. The intent is to give this Agreement a 12-year life and that upon mutual review, the Agreement may be continued or modified based on information available at the time of review.

Article IV. Key Officials

1. Key State of Washington Official:

    Director, Washington Department of Wildlife
    600 North Capitol Way
    Olympia, Washington 98504

2. Key National Park Service Official:

    Regional Director, Pacific Northwest Region
    National Park Service
    83 South King Street, Suite 212
    Seattle, Washington 98104

Article V. Termination

This Supplemental Agreement shall remain in full force and effect unless terminated by mutual consent of the Department and the Service.

Article VI. Required Clauses

1. During the performance of this Supplemental Agreement the participants agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex, or national origin.

2. No member of or delegate to Congress, or resident federal Commissioner, shall be admitted to any share or part of this Supplemental Agreement or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Supplemental Agreement if made with a corporation for its general benefit.

In witness whereof, the parties hereto have executed this Supplemental Agreement:

State of Washington
Department of Wildlife
Olympia, Washington

Curt Smitch 7/11/88
Director Date

National Park Service
Pacific Northwest Region
Seattle, Washington

Charles H Odegaard 7/12/88
Regional Director Date

APPROVED AS TO FORM:

7/11/88
Assistant Attorney General for
Washington State
Attorney for Dept. of Wildlife

APPENDIX A

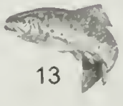
*STOCKING HISTORY = RECORD OR PRESENCE OF FISH/YEAR INTRODUCED

LAKE NAME: UPPER CASE indicates an official USGS lake name.
Lower Case indicates an unofficial lake name.

BT = BROOK TROUT
CT = COASTAL CUTTHROAT TROUT
IC = INTERIOR CUTTHROAT TROUT
GT = GOLDEN TROUT
RT = RAINBOW TROUT

NPS AREA: NCNP (SU/ES)-South Unit of Park, East Slope
NCNP (SU/WS)-South Unit of Park, West Slope
NCNP (NU)-North Unit of Park

	LAKE NAME	LAKE CODE	NPS AREA	LOCATION S	T	R	ELEVATION (FT.)	SURFACE AREA (AC)	STOCKING HISTORY*	SP. LAST STOCKED
	LAKES CURRENTLY BEING STOCKED									
1	JEANITA	OD-1	NCNP (NU)	29	38	13	908	1.3	GT61	GT86
2	Diobsud Lakes	LS-3	NCNP (NU)	32	37	10	479	3.6	CT60	IC83
3	Hi-Yu	M-1	NCNP (NU)	26	37	13	803	4.0	RT61	RT86
4	Nert	M-5	NCNP (NU)	10	37	10	554	2.5	GT65	GT86
5	Triumph	M-17	NCNP (NU)	21	37	11	952	4.9	RT51	RT65
6	THORTON LAKES	M-19	NCNP (NU)	14	37	11	682	12.4	RT41	GT86
7	THORTON LAKES	M-20	NCNP (NU)	23	37	11	452	55.1	RT41	IC76
8	COPPER	MC-6	NCNP (NU)	25	39	10	253	12.9	IC39	IC85
9	Kwahnesum	MC-7	NCNP (NU)	3	39	10	165	16.6	CT66	RB83
10	Firn	MP-2	NCNP (NU)	20	39	13	476	5.1	RT68	IC83
11	NO NAME	PM 1	NCNP (SU)	21	39	13	842	10.9	RT46	RT85
12	Upper Bouck	OD-5	NCNP (SU/WS)	19	37	15	625	4.7	GT68	GT86
13	Wilcox Lakes	EP-5(1)	NCNP (SU/WS)	13	36	11	663	6.7	CT67	RT86
14	Sweetpea	ML-2	NCNP (SU/WS)	13	36	14	515	8.3	RT58	RB85
15	Torment	ML-3	NCNP (SU/WS)	24	36	14	454	3.3	RT68	RB85
16	STILETTO	MR-1	NCNP (SU/ES)	6	34	15	798	9.9	CT66	IC83
17	HIDDEN	SS-1	NCNP (SU/WS)	25	35	12	735	66.2	RT48	RT85
	LAKES WITH SELF-SUSTAINING POPULATIONS									
1	Diobsud Lakes	LS-2	NCNP (NU)	32	37	10	4075	2.5	IC55	IC65
2	IPSOOT	LS-6	NCNP (NU)	9	37	10	5502	8.9	IC36	IC61
3	BLUM LAKES	LS-7	NCNP (NU)	27	38	10	4954	6.9	CT/BT37	CT/BT37
4	GREEN	M-4	NCNP (NU)	15	37	10	4365	79.2	RT46	IC67
5	Lower Berdeen	M-7	NCNP (NU)	11	37	10	4472	7.9	RT46	RT46
6	BERDEEN	M-8	NCNP (NU)	31	37	10	5004	125.5	RT46	IC85
7	BLUM LAKES	M-11	NCNP (NU)	27	38	10	5604	13.8	RT38	GT60
8	Doug's Tarn	M-21	NCNP (NU)	3	37	11	3952	4.9	IC65	IC65
9	Quill Lakes	M-24(1)	NCNP (NU)	29	37	11	4554	1.2	RT61	RT61
10	Quill Lakes	M-24(2)	NCNP (NU)	29	37	11	4528	1.9	RT	RT
11	HANGING	MC-8	NCNP (NU)	38	40	10	4554	73.2	RT/CT	UNK.
12	BEAR	MC-12	NCNP (NU)	24	40	11	5604	25.1	IC67	IC67
13	Mad Eagle	MC-34	NCNP (NU)	7	40	11	5443	1.7	RT	RT
14	SKYMO	PM-3	NCNP (NU)	27	39	13	5279	10.6	IC68	IC68
15	SOURDOUGH	PM-12	NCNP (NU)	21	38	13	4625	27.7	BT35	BT35
16	DOUBTFUL	CP-1	NCNP (SU/ES)	36	35	14	5367	29.7	GT50	IC
17	Wilcox Lakes	EP-6	NCNP (SU/WS)	18	36	13	5135	9.1	RT/CT68	RB/CT68
18	Stout Lake Pond	EP-9(1)	NCNP (SU/WS)	23	35	12	5154	1.6	IC	IC PRES.
19	STOUT	EP-9(2)	NCNP (SU/WS)	24	36	12	5233	26.5	IC49	IC67
20	TRAPPER	GM-1	NCNP (SU/ES)	9	34	14	4167	145.7	CT49	IC68
21	MONOGRAM	M-23	NCNP (SU/WS)	32	36	12	4843	31.4	CT32	RT86
22	DAGGER	MR-4	NCNP (SU/ES)	7	34	15	5512	6.9	IC34	IC34
23	KETTLING	MR-5	NCNP (SU/ES)	16	34	17	5378	9.8	IC/RT	IC/RT



APPENDIX A Page 2

*STOCKING HISTORY = RECORD OF PRESENCE OF FISH/YEAR INTRODUCED

LAKE NAME: UPPER CASE indicates an official USGS lake name.
Lower Case indicates an unofficial lake name.

NPS AREA: NCNP (SU/ES)-South Unit of Park, East Slope
NCNP (SU/WS)-South Unit of Park, West Slope
NCNP (NU)-North Unit of Park

BT = BROOK TROUT
CT = COASTAL CUTTTHROAT TROUT
IC = INTERIOR CUTTHROAT TROUT
GT = GOLDEN TROUT
RT = RAINBOW TROUT

LAKE NAME	LAKE CODE	NPS AREA	LOCATION			ELEVATION	SURFACE	STOCKING	SP. LAST
			S	T	R	(FT.)	AREA (AC)	HISTORY*	STOCKED
LAKES WITH STOCKING HISTORY BUT PRESUMED FISHLESS									
1 Talus Tarn	M-6	NCNP (NU)	10	37	16	355	1.5	CT68	GT68
2 unnamed	M-13	NCNP (NU)	4	37	11	105	2.5	IC65	IC65
3 unnamed	M-14	NCNP (NU)	4	37	11	513	1.5	IC65	IC65
4 THORTON LAKES	M-18	NCNP (NU)	14	37	11	643	30.6	IC68	IC68
5 BLUM LAKES	MC-1	NCNP (NU)	22	38	10	522	3.0	RT38	RT39
6 BLUM LAKES (Vista)	MC-2	NCNP (NU)	25	38	10	906	3.9	GT60	GT60
7 Redoubt	MC-11	NCNP (NU)	12	41	11	302	13.3	IC67	IC67
8 EAST (UPPER)	MC-14(1)	NCNP (NU)	2	39	12	604	2.0	RT67	RT67
9 EAST (LOWER)	MC-14(2)	NCNP (NU)	2	39	11	595	7.4	RT67	RT67
10 MIDDLE (UPPER)	MC-16(1)	NCNP (NU)	10	39	11	702	4.2	RT67	RT67
11 MIDDLE (LOWER)	MC-16(2)	NCNP (NU)	10	39	11	504	2.5	RT67	RT67
12 TAPTO (UPPER)	MC-17(1)	NCNP (NU)	9	39	11	739	9.9	IC60	IC60
13 TAPTO (MIDDLE)	MC-17(2)	NCNP (NU)	9	39	11	333	0.8	IC60	IC60
14 TAPTO (LOWER)	MC-17(3)	NCNP (NU)	9	39	11	590	6.3	IC60	IC60
15 TAPTO (WEST)	MC-17(4)	NCNP (NU)	9	39	11	5710	2.0	IC60	IC60
16 LAKE REVEILLE	MC-21(1)	NCNP (NU)	3	39	11	5013	4.0	PT68	RT68
17 LAKE REVEILLE	MC-21(2)	NCNP (NU)	3	39	11	5203	3.0	RT68	RT68
18 Wild	MC-27	NCNP (NU)	10	39	11	5552	11.5	RT67	RT67
19 AZURE	MP-9	NCNP (NU)	21	33	10	4059	88.0	GT61	GT61
20 SILVER	MS-1	NCNP (NU)	34	41	12	5769	161.0	GT61	GT61
21 unnamed	EP-10	NCNP (SU/WS)	21	36	13	5614	9.3	RT/CT67	RT/CT67
22 unnamed	EP-13	NCNP (SU/WS)	26	36	13	5389	2.1	RT67	RT67
23 unnamed	EP-14	NCNP (SU/WS)	24	35	12	5945	4.4	RT56	RT86
24 unnamed	PP-1	NCNP (SU/WS)	21	35	13	5345	17.5	RT/CT67	RT/CT67
25 Sourpuss	ML-1	NCNP (SU/WS)	10	35	14	4545	0.6	RT68	RB68
26 Vulcan	ML-4	NCNP (SU/WS)	35	35	14	5194	6.1	RT65	RB86

REAFFIRMATION
OF
SUPPLEMENTAL AGREEMENT
TO
MEMORANDUM OF UNDERSTANDING
Between
National Park Service
And
State of Washington Department of Fish and Wildlife

The Supplemental Agreement supplements the Memorandum of Understanding, Agreement No. MU-9000-5-0004 dated August 15, 1985. The purpose of the Supplemental Agreement is to establish a mutually agreed to list of lakes within the boundaries of North Cascades National Park which the Department of Fish and Wildlife will stock with fish as part of its fish management program.

Article III. Term of Agreement, item 2. states:

> *This Supplemental Agreement shall be subject to mutual review and evaluation by July 2000. The intent is to give this Agreement a 12-year life and that upon mutual review, the Agreement may be continued or modified based on information available at the time of review.*

We the undersigned have reviewed and evaluated the Agreement and agree that it should continue in effect without modification through December 2004.

In witness whereof, the parties hereto have reaffirmed this Supplemental Agreement:

State of Washington
Department of Fish and Wildlife
Olympia, Washington

5-29-02
Regional Director Date

National Park Service
North Cascades National Park
Sedro Woolley, Washington

6-3-02
Superintendent Date

SUPPLEMENTAL AGREEMENT
to

MEMORANDUM OF UNDERSTANDING
Between

National Park Service
and
State of Washington Department of Game (now Wildlife)

Article I. Background and Objectives

This Supplemental Agreement supplements the Memorandum of Understanding, Agreement No. MU-9000-5-0004 which was entered into between the Department of Game (now Wildlife) and the Pacific Northwest Region of the National Park Service, dated August 15, 1985, hereinafter referred to as the MOU. This Supplemental Agreement is between the Washington State Department of Wildlife (previously Game), acting through and by the Director, hereinafter referred to as the Department, and the National Park Service acting by and through the Regional Director of the Pacific Northwest Region, hereinafter referred to as the Service.

The purpose of this Supplemental Agreement is to establish a mutually agreed to list of lakes within the boundaries of North Cascades National Park which the Department will stock with fish as part of its fish management program.

Article II. Statements of Work

Recognizing the need to establish mutually agreed upon policy relating to fish stocking in lakes within North Cascades National Park and in keeping with Article II C 1 and 7 of the MOU, the Department and the Service mutually agree:

1. The Department shall be allowed to stock fish and/or provide fish for stocking in 40 lakes within the boundaries of North Cascades National Park as part of the Department's fish management program. These 40 lakes shall consist of those lakes previously agreed to by the Department and the Sevrice as lakes currently being stocked (17), and lakes with self-sustaining populations (23). These are 40 of the lakes within North Cascades National Park which the Department and Service agree have been previously stocked. The 40 lakes that may be stocked are identified as such on Appendix A, which is attached hereto and incorporated herein by this reference.

2. Additions or deletions to the list of 40 lakes may be made only by mutual agreement of the Department and the Service. Research results will be considered in future decisions.

3. The Department shall, in consultation with the Service, provide annual plans to stock fish including number and species of fish, specific lakes, and the stocking frequency of each lake.

Article III. Term of Agreement

1. If the MOU expires or terminates, the parties intend that this Supplemental Agreement shall survive the termination of the MOU and shall continue in effect until terminated as provided herein.

2. This Supplemental Agreement shall ~~first~~ be subject to mutual review and evaluation by July 2000. The intent is to give this Agreement a 12-year life and that upon mutual review, the Agreement may be continued or modified based on information available at the time of review.

Article IV. Key Officials

1. Key State of Washington Official:

Director, Washington Department of Wildlife
600 North Capitol Way
Olympia, Washington 98504

2. Key National Park Service Official:

Regional Director, Pacific Northwest Region
National Park Service
83 South King Street, Suite 212
Seattle, Washington 98104

Article V. Termination

This Supplemental Agreement shall remain in full force and effect unless terminated by mutual consent of the Department and the Service.

Article VI. Required Clauses

1. During the performance of this Supplemental Agreement the participants agree to abide by the terms of Executive Order 11246 on nondiscrimination and will not discriminate against any person because of race, color, religion, sex, or national origin. The participants will take affirmative action to ensure that applicants are employed without regard to their race, color, religion, sex,

2. No member of or delegate to Congress, or resident federal Commissioner, shall be admitted to any share or part of this Supplemental Agreement or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Supplemental Agreement if made with a corporation for its general benefit.

In witness whereof, the parties hereto have executed this Supplemental Agreement:

State of Washington Department of Wildlife Olympia, Washington	National Park Service Pacific Northwest Region Seattle, Washington

Curt Smitch 7/11/88
Director Date

Regional Director Date

APPROVED AS TO FORM:

7/11/88
Assistant Attorney General for
Washington State
Attorney for Dept. of Wildlife

APPENDIX A

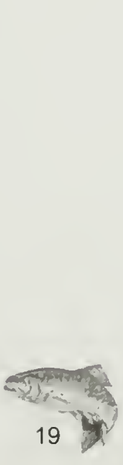
*STOCKING HISTORY = RECORD OR PRESENCE OF FISH/YEAR INTRODUCED

LAKE NAME: UPPER CASE Indicates an official USGS lake name.
Lower Case indicates an unofficial lake name.

BT = BROOK TROUT
CT = COASTAL CUTTTHROAT TROUT
IC = INTERIOR CUTTHROAT TROUT
GT = GOLDEN TROUT
RT = RAINBOW TROUT

NPS AREA: NCNP (SU/ES)-South Unit of Park, East Slope
NCNP (SU/WS)-South Unit of Park, West Slope
NCNP (NU)-North Unit of Park

LAKE NAME	LAKE CODE	NPS AREA	LOCATION S	T	R	ELEVATION (FT.)	SURFACE AREA (AC)	STOCKING HISTORY*	SP. LAST STOCKED
LAKES CURRENTLY BEING STOCKED									
1 JEANITA	DD-1	NCNP (NU)	29	38	13	4908	1.3	GT61	GT86
2 Diobsud Lakes	LS-3	NCNP (NU)	32	37	10	4479	3.6	CT60	IC83
3 Hi-Yu	M-1	NCNP (NU)	26	37	10	3803	4.0	RT61	RT86
4 Nert	M-5	NCNP (NU)	10	37	10	4554	2.5	GT65	GT86
5 Triumph	M-17	NCNP (NU)	21	37	11	3652	4.0	RT61	RT85
6 THORTON LAKES	M-19	NCNP (NU)	14	37	11	4682	12.4	RT41	GT86
7 THORTON LAKES	M-20	NCNP (NU)	23	37	11	4452	58.1	RT41	— IC76
8 COPPER	MC-6	NCNP (NU)	25	39	10	5253	12.9	IC39	IC85
9 Kwahnesum	MC-7	NCNP (NU)	3	39	10	5105	16.6	CT66	— RB83
0 Firn	MP-2	NCNP (NU)	30	39	13	5476	5.1	— RT68	— IC83
1 NO NAME	PM-1	NCNP (NU)	21	39	13	3842	10.9	RT46	RT85
2 Upper Bouck	DD-5	NCNP (SU/WS)	19	37	13	5023	4.7	GT68	GT86
3 Wilcox Lakes	EP-5(1)	NCNP (SU/WS)	18	36	13	5063	6.7	CT67	RT86
4 Sweetpea	ML-2	NCNP (SU/WS)	13	36	14	5535	8.3	RT68	RB85
5 Torment	ML-3	NCNP (SU/WS)	24	36	14	6454	3.3	RT68	RB85
6 STILETTO	MR-1	NCNP (SU/ES)	6	34	18	6798	9.9	CT66	IC83
7 HIDDEN	SB-1	NCNP (SU/WS)	25	35	12	5738	60.2	RT48	—RT85
LAKES WITH SELF-SUSTAINING POPULATIONS									
1 Diobsud Lakes	LS-2	NCNP (NU)	32	37	10	4078	2.5	IC65	IC65
2 IPSOOT	LS-6	NCNP (NU)	8	37	10	4502	8.9	IC36	IC61
3 BLUM LAKES	LS-7	NCNP (NU)	27	38	10	4954	6.9	CT/BT37	CT/BT37
4 GREEN	M-4	NCNP (NU)	15	37	10	4305	79.2	RT46	IC67
5 Lower Berdeen	M-7	NCNP (NU)	11	37	10	4472	7.9	RT46	RT46
6 BERDEEN	M-8	NCNP (NU)	11	37	10	5004	125.5	RT46	IC85
7 BLUM LAKES	M-11	NCNP (NU)	27	38	10	5004	13.8	RT38	GT60
8 Doug's Tarn	M-21	NCNP (NU)	3	37	11	3952	4.9	IC65	IC65
9 Quill Lakes	M-24(1)	NCNP (NU)	29	37	11	4554	1.2	RT61	RT61
0 Quill Lakes	M-24(2)	NCNP (NU)	29	37	11	4528	1.0	RT	RT
1 HANGING	MC-8	NCNP (NU)	38	40	10	4554	73.1	RT/CT	UNK.
2 BEAR	MC-12	NCNP (NU)	24	40	11	5804	28.1	IC67	IC67
3 Mad Eagle	MC-34	NCNP (NU)	7	40	11	5443	1.7	RT	RT
4 SKYMO	PM-3	NCNP (NU)	27	39	13	5279	10.6	IC68	IC68
5 SOURDOUGH	PM-12	NCNP (NU)	21	38	13	4626	27.7	BT35	BT35
6 DOUBTFUL	CP-1	NCNP (SU/ES)	36	35	14	5387	29.7	GT50	IC
7 Wilcox Lakes	EP-6	NCNP (SU/WS)	18	36	13	5138	9.1	RT/CT68	RB/CT68
8 Stout Lake Pond	EP-9(1)	NCNP (SU/WS)	23	36	12	5184	1.6	IC	IC PRES.
9 STOUT	EP-9(2)	NCNP (SU/WS)	24	36	12	5233	26.3	IC49	IC67
0 TRAPPER	GM-1	NCNP (SU/ES)	9	34	14	4167	145.7	CT49	IC68
1 MONOGRAM	M-23	NCNP (SU/WS)	32	36	12	4843	31.4	CT32	RT86
2 DAGGER	MR-4	NCNP (SU/ES)	7	34	18	5512	8.9	IC34	IC34
3 KETTLING	MR-5	NCNP (SU/ES)	16	34	17	5378	9.8	IC/RT	IC/RT



APPENDIX A Page 2

*STOCKING HISTORY = RECORD OR PRESENCE OF FISH/YEAR INTRODUCED

LAKE NAME: UPPER CASE Indicates an official USGS lake name.
Lower Case indicates an unofficial lake name.

NPS AREA: NCNP (SU/ES)-South Unit of Park, East Slope
NCNP (SU/WS)-South Unit of Park, West Slope
NCNP (NU)-North Unit of Park

BT = BROOK TROUT
CT = COASTAL CUTTHROAT TROUT
IC = INTERIOR CUTTHROAT TROUT
GT = GOLDEN TROUT
RT = RAINBOW TROUT

	LAKE NAME	LAKE CODE	NPS AREA	LOCATION			ELEVATION	SURFACE	STOCKING	SP. LAST
				S	T	R	(FT.)	AREA (AC)	HISTORY*	STOCKED
	LAKES WITH STOCKING HISTORY BUT PRESUMED FISHLESS									
1	Talus Tarn	M-6	NCNP (NU)	10	37	10	5355	1.5	GT68	GT68
2	unnamed	M-13	NCNP (NU)	4	37	11	5105	2.5	IC65	IC65
3	unnamed	M-14	NCNP (NU)	4	37	11	4813	1.5	IC65	IC65
4	THORTON LAKES	M-18	NCNP (NU)	14	37	11	5043	30.6	IC68	IC68
5	BLUM LAKES	MC-1	NCNP (NU)	22	38	10	5663	3.0	RT38	RT38
6	BLUM LAKES (Vista)	MC-2	NCNP (NU)	25	38	10	5906	3.0	GT60	GT60
7	Redoubt	MC-11	NCNP (NU)	12	41	11	5302	13.8	IC67	IC67
8	EAST (UPPER)	MC-14(1)	NCNP (NU)	2	39	12	5604	2.0	RT67	RT67
9	EAST (LOWER)	MC-14(2)	NCNP (NU)	2	39	11	5506	7.4	RT67	RT67
10	MIDDLE (UPPER)	MC-16(1)	NCNP (NU)	10	39	11	5702	4.2	RT67	RT67
11	MIDDLE (LOWER)	MC-16(2)	NCNP (NU)	10	39	11	5604	2.5	RT67	RT67
12	TAPTO (UPPER)	MC-17(1)	NCNP (NU)	9	39	11	5730	9.9	IC60	IC60
13	TAPTO (MIDDLE)	MC-17(2)	NCNP (NU)	9	39	11	5713	0.8	IC60	IC60
14	TAPTO (LOWER)	MC-17(3)	NCNP (NU)	9	39	11	5690	0.3	IC60	IC60
15	TAPTO (WEST)	MC-17(4)	NCNP (NU)	9	39	11	5710	2.0	IC60	IC60
16	LAKE REVEILLE	MC-21(1)	NCNP (NU)	3	39	11	5013	4.0	RT68	RT68
17	LAKE REVEILLE	MC-21(2)	NCNP (NU)	3	39	11	5003	3.0	RT68	RT68
18	Wild	MC-27	NCNP (NU)	10	38	11	4882	11.3	RT67	RT67
19	AZURE	MP-9	NCNP (NU)	21	38	10	4059	88.0	GT61	GT61
20	SILVER	MS-1	NCNP (NU)	34	41	12	6769	161.0	GT61	GT61
21	unnamed	EP-10	NCNP (SU/WS)	21	36	13	5614	9.8	RT/CT67	RT/CT67
22	unnamed	EP-13	NCNP (SU/WS)	26	36	12	5384	2.1	RT67	RT67
23	unnamed	EP-14	NCNP (SU/WS)	24	35	12	5945	4.4	RT66	RT86
24	unnamed	FP-1	NCNP (SU/WS)	21	36	13	5345	17.5	RT/CT67	RT/CT67
25	Sourpuss	ML-1	NCNP (SU/WS)	10	36	14	4843	0.6	RT68	RB68
26	Vulcan	ML-4	NCNP (SU/WS)	35	36	14	5194	8.1	RT68	RB86

APPENDIX B: CONSENT DECREE

CC TO JUDGE
FILED ENTERED
LODGED RECEIVED

APR 12 1991

AT SEATTLE
CLERK U.S. DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
BY DEPUTY

UNITED STATES DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
AT SEATTLE

NORTH CASCADES CONSERVATION COUNCIL, a nonprofit Washington corporation, Plaintiff, v. MANUEL LUJAN, Secretary of the United States Department of the Interior, et al., Defendants.	Civ. No. C-89-1342D CONSENT DECREE

FILED ENTERED 4/24/
LODGED RECEIVED

APR 22 1991

AT SEATTLE
CLERK U.S. DISTRICT COURT
WESTERN DISTRICT OF WASHINGTON
BY DEPUTY

The parties, plaintiff North Cascades Conservation Council, and the defendants, Manuel Lujan, Secretary of the United States Department of the Interior, James M. Ridenour, Director of the United States National Park Service, Charles H. Odegaard, Regional Director of the United States National Park Service, Pacific Northwest Region, and John R. Earnst, Superintendent of the North Cascades National Park Complex ("defendants"), having conferred with counsel and desiring to resolve this dispute between the parties without the intervention of the court, and in consideration of mutual promises, hereby stipulate and agree to undertake the actions set forth below.

ORIGINAL 31

suitability of the river for wild and scenic designation subject to available funding. NPS review will be completed within one year of the issuance of the Final EIS.

B. Environmental Learning Center: NPS planning for this facility will undergo a separate NEPA review process and will not be analyzed in the LCNRA EIS.

C. Fish Stocking NEPA Review: NPS will conduct a NEPA review of the fish-stocking of naturally fish-free lakes within NCNP upon the completion of on-going research; the review will not be initially included in the LCNRA EIS, and may be subject to either separate NEPA compliance or by tiering from the LCNRA EIS. This review shall also evaluate management measures to protect all natural stocks (such as gear restrictions, size and catch limits, or "catch and release" requirements).

D. Protection of Wetlands: NPS shall prohibit development, including placement of rip-rap and road fill and construction of structures, on federally owned wetlands within LCNRA. Where rip-rap is absolutely necessary and the only viable alternative for the protection of life or structures, however, it may be employed along stream courses such as the Stehekin River. Such necessary placement of rip-rap along stream courses will occur only when appropriate permits have been obtained from the United States Army Corps of Engineers, and shall avoid "wetlands," defined under Section 404 of the Corps' regulations as a marsh, swamp, or bog, wherever possible.

E. Additional Studies: NPS will continue to conduct natural and cultural resource studies as necessary to manage the LCNRA subject to available funding.

F. Limitation on Rip-Rapping: NPS will cease using rip-rapping along the Stehekin River except when necessary along with other emergency actions to protect life or structures, but even in these instances, such emergency actions will not be accomplished, if possible, in a long-term and irreversible fashion.

G. Attorneys' Fees Awarded to Plaintiff: The parties bound by this Decree agree that plaintiff is entitled, pursuant to 28 U.S.C. § 2412(d), to an award of reasonable and appropriate litigation expenses incurred by plaintiff in the amount of $39,170.30. This represents $38,000.00 in attorneys' fees and $1170.30 in litigation costs.

Respectfully submitted this 10th day of April, 1991.

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ORDER

INASMUCH as the parties have consented to entry of the foregoing Consent Decree and requested this Court's approval and entry thereof; and

INASMUCH as good cause appears therefor,

THIS CONSENT DECREE IS HEREBY APPROVED AND ENTERED.

IT IS SO ORDERED.

DATED: 4-22-91

UNITED STATES DISTRICT JUDGE

Canada
Mt. Baker Wilderness
Mt. Shuksan
North C
Nationa
(north
Baker Lake
Skagit River
Marblemount
Sauk River
Suiattle River
Darrington
Boulder River Wilderness
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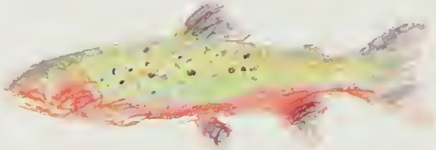
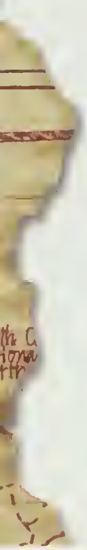


Appendix B

Timeline of Events Related to Fish Stocking in the North Cascades Complex



APPENDIX B: TIMELINE OF EVENTS RELATED TO FISH STOCKING IN THE NORTH CASCADES COMPLEX

The following is a summary of the events related to the history of the North Cascades Complex, fish stocking of mountain lakes in the North Cascades Complex, and litigation and agreements between the Washington Department of Fish and Wildlife (WDFW) and the National Park Service (NPS).

5,000 B.C. – Native Americans inhabited the area, living from the land by fishing, hunting, and gathering.

Late 1700s – The first Euro-Americans began to settle the area.

1814 – The first recorded crossing of the North Cascades by European fur trader, Alexander Ross.

1846 – The United States established title to the Oregon Territory.

1850s – Congress passed the *Homestead Act* and Donation Land Claim Laws to encourage settlement of the area.

Late 1800s – Lakes were first stocked with exotic trout by settlers for food and recreation.

1890s – Congress established two large forest reserves in the North Cascades region that were administered by the General Land Office of the Department of the Interior. Out of these reserves, Congress created Mount Rainier National Park in 1899, and the remaining land was later transferred to the administrative jurisdiction of the U.S. Forest Service, which established five national forests in the area.

1905 – President Roosevelt transferred jurisdiction of the forest reserves from the U.S. Department of the Interior to the newly created U.S. Forest Service.

1907 – The Washington National Forest was created.

1924 – The Washington National Forest was renamed Mount Baker National Forest.

1930s – Stocking had become an established practice in the North Cascades. The Washington Department of Fish and Game (now the Department of Fish and Wildlife) took over responsibility for stocking, which became a major component of its recreational fishing program. Also in the 1930s, recreational groups such as the Washington State Hi-Lakers and Trail Blazers, Inc. were formed. The groups' purpose was to experience and enhance fishing opportunities in the high mountain lakes by carrying out stocking programs. By 1969, the WDFW and fishing groups had stocked 75 lakes in what is now the North Cascades Complex. The lakes that were stocked were thought to be able to support fish populations.

1963 – President Kennedy ordered a review of the North Cascades region in order to determine the highest and best use of the area.

1968 – On October 2, the North Cascades National Park Service Complex was created from land previously included in the Mount Baker National Forest. The purpose and significance of the North Cascades Complex was essentially to preserve and protect lands and provide recreational opportunities for public enjoyment.

1969-1977 – Fish stocking dropped to only four permitted fish plants in the park and seven in the Ross Lake and Lake Chelan National Recreation Areas during this eight-year period.

1975 – The park superintendent instituted a policy that prohibited fish stocking in naturally barren (fish-free) lakes and would not stock those lakes into which native trout had been introduced, allowing naturally reproducing trout to remain. The policy would not affect the two national recreation areas. The superintendent received considerable anger and resistance from fishing groups (Hi-Lakers and Trail Blazers) and the Washington Department of Game, as well as political pressure from Senator Henry M. Jackson's office (Louter 1998). In response, the superintendent proposed a policy variance that would consider stocking on a lake-by-lake basis and not include lakes containing reproducing (self-sustaining) populations or that were fishless at the time. The policy variance was made in hopes of appeasing the Washington Department of Game and possibly lead to a more formal memorandum of understanding between the two agencies. The superintendent also noted the possibility of complete negation of the original policy because some disgruntled anglers might illegally stock exotic species of fish in the high lakes to continue the fishery.

1979 – The NPS issued a management policy variance and entered into agreement with the Washington Department of Game that allowed stocking of nonnative trout to continue at regular intervals in selected lakes.

1985 – The NPS attempted to phase out stocking but received strong objection from the Department of Game. Intense public debate and congressional interest elevated the issue to a national level. Both agencies signed a Memorandum of Understanding (MOU) on August 15, 1985 (see appendix A for a copy of the MOU).

June 12, 1986 – The director of the NPS issued a policy statement that placed all mountain lakes in the North Cascades Complex into three categories: (1) natural fish-free waters, (2) self-sustaining fish population waters, and (3) continue-to-stock waters. The policy basically allowed fish stocking to occur in waters that currently had fish populations and allowed other waters to remain fish-free. It acknowledged that some lakes might be "potential candidates for continued fish stocking . . . " It called for a review to "determine which waters warrant management as an enhanced recreational fishery, and for which continued fish stocking is to be an acceptable action." The statement suggested a research effort that would focus on the following: (1) establish current fish and aquatic habitat baseline conditions, (2) monitor impacts of fish stocking, and (3) determine changes over time referenced against current baseline or undisturbed natural conditions. The intent of the research would be to provide an informed basis for fish-stocking management in the future (see appendix A for a copy of the 1986 NPS memorandum ["policy waiver"]).

1987 – The Washington Department of Game (name changed to Department of Wildlife) announced plans to stock 12 lakes in the North Cascades Complex that were not approved by the NPS for fish stocking. The NPS responded with a warning that anyone caught stocking these lakes would be issued a violation notice and prosecuted in federal court. No stocking occurred.

1988 – A lawsuit was brought by the North Cascades Conservation Council against the NPS. The council alleged that the environmental assessment associated with the 1988 *General Management Plan* for the North Cascades Complex was not in compliance with the *National Environmental Policy Act* (NEPA).

July 12, 1988 – The Department of Wildlife dropped their 1987 and 1988 plans to stock fish. The NPS and the Department of Wildlife agreed to sign a 12-year Supplemental Agreement (see appendix A) to the 1985 MOU that allowed fish stocking to continue in 17 lakes and allowed self-sustaining fish populations to continue in 23 lakes while the NPS conducted research. It also stipulated that any additions or deletions to the list of lakes would be made only by mutual agreement and added the caveat that research results would be considered in future decisions.

1988 – The NPS initiated a long-term research effort through Oregon State University to evaluate the effects of fish stocking on native biota in mountain lakes.

November 16, 1988 – The *Washington Wilderness Act* was passed.

1991 – A Consent Decree (see appendix A for a copy) between the NPS and the North Cascades Conservation Council was signed. The Consent Decree, among many things, dictated that the "National Park Service conduct a NEPA review of the fish stocking of naturally fish-free lakes . . . upon completion of ongoing research." It also stipulated that the review would evaluate management measures to protect all natural stocks.

2000 – The Washington Department of Fish and Wildlife (WDFW, formerly Department of Game and then Department of Wildlife) agreed to a proposal by the NPS to extend the project two years (to 2002) while the U.S. Geological Survey-Biological Resources Division (USGS-BRD) finished a final research report. The USGS-BRD research focused on the effects of fish stocking on naturally fish-free lakes. The first phase research report was completed in 1995, the second phase was completed in 1998, and the final phase was completed in July 2002.

2002 – The NPS initiated development of this *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS). Preparation of this document is guided by NPS policies, and it conforms to requirements of NPS *Director's Order 12: Conservation Planning, Environmental Impact Analysis, and Decision-making*, and Handbook and NEPA. A letter from the WDFW to the North Cascades Complex superintendent reaffirms through 2004 the intent of the 1988 Supplemental Agreement to the 1985 MOU. The letter agrees to no changes in stocking (lakes, species, and frequency). The letter also agrees to collaborate with the NPS on an environmental assessment leading to a long-term fishery management plan.

2003 – Public Scoping formally began on January 16, 2003, with the *Federal Register* publication of the notice of intent to prepare this draft plan/EIS (Federal Register Vol. 68(11), pp. 2355–2356). In March 2003, the NPS and WDFW held four public scoping meetings to discuss issues and management alternatives for this draft plan/EIS. The public comment period ended on April 18, 2003. From April 2003 to April 2005, the NPS prepares the draft plan/EIS with input from the WDFW (the cooperating agency).

2005 – The draft plan/EIS is distributed for agency and public review and comment in spring 2005.

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Appendix C

Special Status Species

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APPENDIX C: SPECIAL STATUS SPECIES

TABLE C-1: THREATENED AND ENDANGERED FISH AND WILDLIFE IN THE NORTH CASCADES COMPLEX

Common Name	Latin Name	Status	
		Federal	State
American peregrine falcon	*Falco peregrinus anatum*	Species of concern	Endangered
Bald eagle	*Haliaeetus leucocephalus*	Threatened	Threatened
Black-backed woodpecker	*Picoides albolarvatus*		Candidate
Bull trout	*Salvelinus confluentus*	Threatened	
California wolverine	*Gulo gulo luteus*	Species of concern	Threatened
Canada lynx	*Lynx canadensis*	Threatened	Threatened
Cascades frog	*Rana cascadae*	Species of concern	
Chinook salmon	*Oncorhynchus tshawtscha*	Threatened	
Columbia spotted frog	*Rana luteiventris*	Species of concern	Candidate
Ferruginous hawk	*Buteo regalis*	Species of concern	Threatened
Flammulated owl	*Otus flammeolus* - eastside only		Candidate
Fringed myotis	*Myotis thysanodes*	Species of concern	
Golden eagle	*Aquila chrysaetos*		Candidate
Gray wolf	*Canus lupus*	Endangered	Endangered
Grizzly bear	*Ursus arctos*	Threatened	Endangered
Harlequin duck	*Histrionicus histrionicus*	Species of concern	
Keen's myotis	*Myotis keenii*		Candidate
Lewis' woodpecker	*Melanerpes lewis*		Candidate
Little willow flycatcher	*Empidonax traillii brewsteri*	Species of concern	
Long-eared myotis	*Myotis evotis*	Species of concern	
Long-legged myotis	*Myotis volans*	Species of concern	
Marbled murrelet	*Brachyramphus marmoratus marmoratus*	Threatened	Threatened
Merlin	*Falco columbarius*		Candidate
Northern goshawk	*Accipiter gentilis*	Species of concern	Threatened
Northern red-legged frog	*Rana aurora aurora*	Species of concern	
Northern spotted owl	*Strix occidentalis caurina* -	Threatened	Endangered
Olive-sided flycatcher	*Contopus borealis*	Species of concern	
Pacific fisher	*Martes pennanti pacifica*	Species of concern	Endangered
Pileated woodpecker	*Dryocopus pileatus*		Candidate
Small-footed myotis	*Myotis ciliolabrum*	Species of concern	
Tailed frog	*Ascaphus truei*	Species of concern	
Townsend's big-eared bat	*Corynorhinus townsendii*	Species of concern	Threatened
Vaux's swift	*Chaetura vauxi*		Candidate
Western gray squirrel	*Sciurus griseus griseus*	Species of concern	Threatened
Western toad	*Bufo boreas*	Species of concern	Candidate
Western toad	*Bufo boreas*		Candidate
Westslope cutthroat trout	*Oncorhynchus clarki lewisi*	Species of concern	
Yuma myotis	*Myotis yumanensis*	Species of concern	

TABLE C-2: STATE OF WASHINGTON SPECIAL STATUS SPECIES

Scientific Name	Common Name	Wetland Rating	East or West	Elevation (feet)	Habitat	Blooming time	Washington State Status
Graminoids							
Carex scripoidea var. scirpoidea	Canadian single spike sedge	FACU	Both	5,000–7,200	Moist meadows, streambanks, rocky slopes	July–August	Sensitive
Carex scopulorum var. prionophylla	Mountain sedge	FACW	East	4,600	Moist-wet meadows, lakeshores, streambanks	July–August	Watch
Carex stylosa	Long styled sedge	FACW	West	2,700–6,700	Marshes, streambanks, bogs, wet depressions, seeps	August–September	Sensitive
Eleocharis atropurpurea	Purple spike rush	OBL	East	500 in CA	Wet ground, lake shores	Annual, early spring	Possibly extirpated
Eriophorum viridicarinatum	Green keeled cottongrass	OBL	Both	2,000–6,600	Cold swamps and bogs	June–July	Sensitive
Poa arctica ssp. arctica	Gray's bluegrass	FACU	Both		Alpine ridges		Review group 2
Forbs							
Agoseris elata	Tall agoseris	UPL	Both	5,000–7,000	Open moist woods, rocky or talus, shrubby slopes	June–August	Sensitive
Aster sibericaus	Arctic Aster	UPL	Both	4,000–7,200	Open rocky gravelly places at high elevation	July–August	Sensitive
Astagalus arrectus	Palouse milk vetch	UPL	East	1,000–4,000	Grassy hillsides, sagebrush flats openings in Ponderosa Pine or Douglas fir forest gravelly or sandy flats	Late April–June	Threatened
Campanula lasiocarpa	Alaska harebell	UPL	West	6,500–7,000	Rock crevices in alpine zones	July–August	Sensitive
Cicuta bulbifera	Bulb-bearing hemlock	OBL	Both	240–3,700	Edges of marshes, lakes, bogs, meadows shallow standing or slow moving water	August–September	Sensitive
Cimicifuga elata	Tall bubane	UPL	West	600–3,000	Moist shady woods in mature or old growth coniferous deciduous forest	May–August	Sensitive
Coptis asplenifolia	Spleenwort-leaved goldthread	FAC	West	0–3,000	Open rocky areas in moist coniferous forests	April–May	Sensitive
Corydalis aurea	Golden smoke	UPL	Both	300–6,000	Moist to dry well drained soil, gravelly open areas	May–July	Watch
Cyperpedium faciculatum	Clustered lady slipper	FACU	Both	1,200–5,000	Moist to dry and rocky open conifer forest	May–mid-June	Sensitive
Cyperpedium parviflorum	Yellow lady slipper	UPL	East	2,100–3,400	Bogs, seeps, margins of lakes and ponds, moist woods	May–June	Threatened

TABLE C-2: STATE OF WASHINGTON SPECIAL STATUS SPECIES (CONTINUED)

Scientific Name	Common Name	Wetland Rating	East or West	Elevation (feet)	Habitat	Blooming time	Washington State Status
Forbs (continued)							
Dodecatheon pulchellum var. watsonii	Few flowered shooting star	FACW	Both	5,500–7,500	Meadows and rock out crops subalpine and alpine	July	Watch
Draba aurea	Golden draba	UPL	Both	6,000–7,000	Open to forested slopes, to alpine meadows	June–August	Sensitive
Epipactis gigantea	Giant hellebore	OBL	Both	0–4,000	Streambanks, lake shores, seeps, springs	April–July	Watch
Erigeron salsihii	Salish fleabane	UPL	East	6,000–8,000	Dry alpine ridges	July–August	Sensitive
Eritrichium nanum var. elongatum	Pale forget-me-not	UPL	East	7,000–9,000	Open rocky places	June–August	Sensitive
Erythonium revolutum	Pink fawn lily	FAC	West	100–200	River banks, edge of woods, open or moderate shade	April–May	Sensitive
Fritallaria camschatcensis	Black lily	UPL	West	0–3,000	Moist to wet meadow, open, riparian areas, tide flats	May–June	Sensitive
Galium kamtschaticum	Boreal bedstraw	UPL	West	1,500–2,100	Moist coniferous forest, seeps and areas of standing water	July–August	Watch
Gentiana glauca	Glaucous gentian	FAC	Both	7,000–8,000	Tundra, dry to moist alpine areas	July–September	Sensitive
Githopsis specularioides	Common blue-cup	UPL	Both	200–2,300	Dry, open places in foothill, areas of thin soils, talus slopes	April–June	Sensitive
Hackelia hispida var. disjuncta	Sagebrush stickseed	UPL	East	600–2,100	Cliffs rocky, talus slopes grasslands to open forest	May–June	Sensitive
Hackelia venusta	Showy stickseed	UPL	East	1,000–2,500	Dry loose granitic sand and crevices in granite or talus, Ponderosa pine forest	May–June	Endangered
Hypericum majus	Canadian St. John's wort	FACW-	Both	100–2,300	Along ponds and lakeshores, riparian areas	July–September	Sensitive
Iliamna longisepala	Longsepal globemallow	UPL	East	500–4,500	Sagebrush steppe, open hillsides, dry streams, open Ponderosa and Douglas fir forest	June–August	Sensitive
Impatiens aurelia	Orange balsam	FACW	Both	Low elevation	Moist shaded areas	June–August	Review group 2
Limosella acaulis	mudwort	OBL	Both	< 4000	Ponds edges, lakeshores, river edges in areas of slow moving water	May–November	Watch
Listera borealis	Northern twayblade	FACU	Both	3,000–6,500	Moist woods in moderate to deep shade, along streams, associated with old growth or old second growth	June–July	Watch
Lobelia dortmanna	Water lobelia	OBL	West	0–500	Shallow low elevation ponds and lakes	June–August	Threatened
Loiseleurua procumbens	Alpine Azalea	UPL	Both	6,300	Alpine slopes and subalpine meadows	July–August	Threatened

TABLE C-2: STATE OF WASHINGTON SPECIAL STATUS SPECIES (CONTINUED)

Scientific Name	Common Name	Wetland Rating	East or West	Elevation (feet)	Habitat	Blooming time	Washington State Status
Forbs (continued)							
Mimulus pulsiferae	Pulsifer's Monkey-Flower	UPL	East	1,000–2,000	Seasonally moist, open places in foothills, and openings in Ponderosa Pine/Douglas fir forest	June–July	Sensitive
Mimulus suksdorfii	Suksdorf's monkey flower	FAC-	East	2,000–4,000	Moist areas in sagebrush steppe/Ponderosa Pine forest	May–August	Sensitive
Mimulus washingtonensis	Washington monkey-flower	OBL	East	Low elevation	Wet to moist places at low elevation	May–September	Possibly extirpated
Orthocarpus bracteosus	Rosy owl's clover	UPL	Both	1,500–2,500	Moist meadows at low elevation in transition zone between wetland and upland	June–August	Endangered
Parnassia kotzebuei var. kotzebuei	Kotzebue's grass-of parnassus	OBL	East	No data available	Alpine areas	July–September	Sensitive
Penstemon eriantherus var. whitedii	Fuzzy-tongued penstemon	UPL	East	3,500	Open sagebrush shrub, open areas in valleys and foothills	May–July	Sensitive
Petrophyton cinerascens	Chelan rockmat	UPL	East	800–1,800	Ledges and crevices of cliffs and rocky outcrops	July–August	Endangered
Pinguicula vulgaris	Common butterwort	OBL	Both	1,500–7,000	Moist seeps, meadows and talus slopes	July–August	Watch
Planthera obtusata	Small northern bog orchid	FACW	Both	800–5,000	Moist places in forests, bogs, streambanks, marshes, meadows	June–July	Sensitive
Pleuricospora fimbriolata	Sierra sap	UPL	Both	1,000–4,000	Dry coniferous forest with little understory	July–August	Watch
Polemonium viscosum	Skunk polemonium	UPL	East		Open rocky place in high elevation, mostly above timberline	July–August	Sensitive
Potemogeton obtusifolius	Blunt leaved pondweed	OBL	West	50–2,000	Waters of lakes and slow moving streams	August–September	Sensitive
Potentilla diversifoia var. perdissecta	Diverse-leaved cinquefoil	UPL	West	6,500–8,000	Montane to alpine, rocky slopes, meadows and streambanks	June–August	Sensitive
Ranuculus cooleyea	Cooley's buttercup	FAC	West	1,500–6,000	Moist slopes and rock crevices	July–August	Sensitive
Salix tweedyi	Tweedy's willow	FACW-	East	5,200–7,200	Streambanks moist meadows in mid to high elevation meadows	June–July	Sensitive
Salix vestita var. erecta	Rock willow	FAC	East	High elevation	Open moist areas in springs or wetlands near or above timberline	July–September	Possibly extirpated
Sanicula marilandica	Black snake-root	UPL	East	2,900–5,200	Low moist ground, meadows, marsh edges, riparian flood plains	June–August	Sensitive

TABLE C-2: STATE OF WASHINGTON SPECIAL STATUS SPECIES (CONTINUED)

Scientific Name	Common Name	Wetland Rating	East or West	Elevation (feet)	Habitat	Blooming time	Washington State Status
Forbs (continued)							
Saxifraga integrifolia var. apetala	Swamp saxifrage	FACW	East	5,900–6,500	Vernally moist meadows, seeps and ephemeral streams	March–July	Watch
Saxifraga rivularis	Pygmy saxifrage	FACW	Both	5,500–7,000	Damp cliffs, shaded rock outcrops, talus near snow banks, moist meadows	July–August	Sensitive
Saxifragopsis fragarioides	Strawberry saxifrage	UPL	East	1,400–4,500	Crack and crevices on cliffs and rock outcrops in Ponderosa pine and Douglas fir forest	June–July	Threatened
Silene seelyi	Seely's silene	UPL	East	1,500–6,300	Cliffs and talus slopes	May–August	Sensitive
Spiranthes porrifolia	Western ladies tresses	UPL	Both	60–6,800	Meadows, seeps streams	May–August	Sensitive
Swertia perennis	Swertia	UPL	Both	4,000	Montane to subalpine meadows, streambanks	July–August	Review group 1
Trifolium thompsonii	Thompson's clover	UPL	East	140–4,000	Open to sparsely wooded sagebrush community, near edges of the Ponderosa pine zone	May–June	Threatened
Utricularia minor	Lesser bladderwort	OBL	Both	300–2,000	Shallow standing or slowly moving water	June-September	Review group 1
Botrychium lanceolatum	Lance-leafed moonwork	FACW	Both	760–6,000	Moist sites, alpine meadows	June–September	Watch
Botrychium lunaria	Common moonwort	FAC	Both	3,000–6,400	Moist open areas in meadows and forests	June–September	Watch
Botrychium minganense	moonwort	UPL	Both	2,000–5,700	Moist sites in deciduous and coniferous forest, subalpine sites	June–September	Watch
Botrychium pedunculosum	Stalked moonwort	UPL	Both	1,600–3,000	Moist wooded sites	June–September	Sensitive
Botrychium pinnatum	Northwestern moonwort	UPL	Both	2,100–6,500	Dry to moist forest, subalpine meadows and alpine ridge tops	June–September	Watch
Boytrichium simplex	Little moonwort	FAC	Both	5,000–7,000	Moist to dry meadows, bogs, swamps	June–September	Watch
Cryptogramma stelleri	Steller's rockbrake	UPL	East	3,000	Moist shaded cliffs, ledges, rocky slopes, often on limestone	June	Sensitive
Lycopodiella inundata	Bog clubmoss	FACW	West	1,500–6,400	Bogs, marshes, pond margins	July	Sensitive
Lycopodium dendtoideum	Treelike clubmoss	FACU	Both	800–3,600	Rock outcrops, talus fields, moss and significant debris layer	June–July	Sensitive
Pellea brachyptera	Sierra cliff brake	UPL	East	770–2,200	Dry Rocky slopes, talus, outcrops in Douglas fir and Ponderosa Pine forest	August–September	Sensitive

United States Department of the Interior
NATIONAL PARK SERVICE
North Cascades National Park
Lake Chelan National Recreation Area
Ross Lake National Recreation Area
810 State Route 20
Sedro-Woolley, Washington 98284-1239

IN REPLY REFER TO:
L76

July 29, 2003

Tamara Black
U.S. Fish and Wildlife Service
Western Washington Office
510 Desmond Drive SE, Suite 102
Lacey, Washington, 98503

Dear Ms. Black:

The National Park Service (NPS), North Cascades National Park Service Complex (NOCA) and the Washington Department of Fish and Wildlife (WDFW) are currently collaborating on an Environmental Impact Statement (EIS) for mountain lakes fishery management. The EIS will include an assessment of non-native trout stocking and potential restoration of lakes with reproducing populations of non-native trout. The NPS is the lead agency, and WDFW is a Cooperating Agency. In accordance with Section 7 of the Endangered Species Act, we wish to begin informal consultation with your agency so that we may fully evaluate the potential effects of fisheries management actions on federally listed species.

The EIS formally began with publication of the enclosed Notice of Intent on January 16, 2003. Four public scoping meetings were held in March 2003, and we are now working on the Draft EIS. Based on results of internal and public scoping, we have defined the geographic scope of management actions considered in the EIS to include all *natural* (i.e. unregulated) mountain lakes, rivers and creeks in North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area. The EIS will not govern fisheries management in NOCA reservoirs (Lake Chelan, Ross Lake, Diablo Lake, and Gorge Lake) or the Skagit River. These water bodies, however, along with those on adjacent lands will be considered in the watershed-based impact assessment

We wish to request the most current list of Rare, Threatened and Endangered species that potentially inhabit NOCA, along with any pertinent critical habitat designations. We also understand that the westslope cutthroat trout is being petitioned for listing as Threatened throughout its range. We are very concerned about interbreeding of westslope cutthroat trout and non-native rainbow trout in the Stehekin river watershed, and wish to request any information that may help us in the biological evaluation process for the EIS

For more technical information on the EIS, call or e-mail Roy Zipp, Natural Resource Specialist at 360-873-4590 extension 31; roy_zipp@nps.gov. You may also wish to visit the website at: www.nps.gov/noca/highlakes.htm.

Sincerely,

Daniel L. Allen
Resource Management Specialist

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Washington Fish and Wildlife Office
510 Desmond Drive SE, Suite 102
Lacey, Washington 98503
Phone: (360) 753-9440 Fax: (360) 534-9331

AUG 2 6 2003

Dear Species List Requester:

We (U.S. Fish and Wildlife Service) are providing the information you requested to assist your determination of possible impacts of a proposed project to species of Federal concern. Attachment A includes the listed threatened and endangered species, species proposed for listing, candidate species, and/or species of concern that may be within the area of your proposed project.

Any Federal agency, currently or in the future, that provides funding, permitting, licensing, or other authorization for this project must assure that its responsibilities under section 7(a)(2) of the Endangered Species Act of 1973, as amended (Act), are met. Attachment B outlines the responsibilities of Federal agencies for consulting or conferencing with us.

If both listed and proposed species occur in the vicinity of a project that meets the requirements of a major Federal action (i.e., "major construction activity"), impacts to both listed and proposed species must be considered in a biological assessment (BA) (section 7(c); see Attachment B). Although the Federal agency is not required, under section 7(c), to address impacts to proposed species if listed species are not known to occur in the project area, it may be in the Federal agency's best interest to address impacts to proposed species. The listing process may be completed within a year, and information gathered on a proposed species could be used to address consultation needs should the species be listed. However, if the proposed action is likely to jeopardize the continued existence of a proposed species, or result in the destruction or adverse modification of proposed critical habitat, a formal conference with us is required by the Act (section 7(a)(4)). The results of the BA will determine if conferencing is required.

The Federal agency is responsible for making a determination of the effects of the project on listed species and/or critical habitat. For a Federal agency determination that a listed species or critical habitat is likely to be affected (adversely or beneficially) by the project, you should request section 7 consultation through this office. For a "not likely to adversely affect" determination, you should request our concurrence through the informal consultation process.

Candidate species and species of concern are those species whose conservation status is of concern to us, but for which additional information is needed. Candidate species are included as an advance notice to Federal agencies of species that may be proposed and listed in the future. Conservation measures for candidate species and species of concern are voluntary but recommended. Protection provided to these species now may preclude possible listing in the future.

For other federally listed species that may occur in the vicinity of your project, contact the National Marine Fisheries Service (NOAA Fisheries) at (360) 753-9530 to request a list of species under their jurisdiction. For wetland permit requirements, contact the Seattle District of the U.S. Army Corps of Engineers for Federal permit requirements and the Washington State Department of Ecology for State permit requirements.

Thank you for your assistance in protecting listed threatened and endangered species and other species of Federal concern. If you have additional questions, please contact Tami Black at (360) 753-4322 or Yvonne Dettlaff at (360) 753-9582.

Sincerely,

L. Karolee Owens

for Ken S. Berg, Manager
Western Washington Fish and Wildlife Office

Enclosure(s)

ATTACHMENT A August 22, 2003

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CRITICAL HABITAT, CANDIDATE SPECIES, AND SPECIES OF CONCERN THAT MAY OCCUR IN WESTERN WASHINGTON
PREPARED BY
U.S. FISH AND WILDLIFE SERVICE
WESTERN WASHINGTON OFFICE

(Revised July 14, 2003)

FWS REF: 1-3-03-SP-1754

SKAGIT COUNTY

LISTED

Wintering bald eagles (*Haliaeetus leucocephalus*) occur in the county from about October 31 through March 31.

There are 25 bald eagle communal winter night roosts located in the county.

There are eight bald eagle wintering concentrations located in the county in the following areas: Fidalgo Island; Guemes Island; Skagit River-S. Fork Nooksack River; Skagit River; Skagit-Sauk Rivers; Corkindale Staging Area; Illabot Creek Staging Areas; and Samish Bay.

There are 46 bald eagle nesting territories located in the county. Nesting activities occur from about January 1 through August 15.

Bull trout (*Salvelinus confluentus*) occur in the county.

Canada lynx (*Lynx canadensis*) may occur in the county.

Gray wolves (*Canis lupus*) may occur in the county.

Grizzly bears (*Ursus arctos = U. a. horribilis*) may occur in the county.

Marbled murrelets (*Brachyramphus marmoratus*) occur in the county.

Northern spotted owls (*Strix occidentalis caurina*) occur in the county throughout the year.

Major concerns that should be addressed in your biological assessment of the project impacts to listed species include:

1. Level of use of the project area by listed species;

2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project; and

3. Impacts from project construction (i.e., habitat loss, increased noise levels, increased human activity) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for the northern spotted owl has been designated in Skagit County.
Critical habitat for the marbled murrelet has been designated in Skagit County.

PROPOSED

None

CANDIDATE

Oregon spotted frog (*Rana pretiosa*)

SPECIES OF CONCERN

California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific fisher (*Martes pennanti pacifica*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Western toad (*Bufo boreas*)

ATTACHMENT A **August 22, 2003**

LISTED AND PROPOSED ENDANGERED AND THREATENED SPECIES, CRITICAL HABITAT, CANDIDATE SPECIES, AND SPECIES OF CONCERN THAT MAY OCCUR IN WESTERN WASHINGTON

PREPARED BY
U.S. FISH AND WILDLIFE SERVICE
WESTERN WASHINGTON OFFICE

(Revised July 14, 2003)

FWS REF: 1-3-03-SP-1754

WHATCOM COUNTY

LISTED

Wintering bald eagles (*Haliaeetus leucocephalus*) occur in the county from about October 31 through March 31.

There are 24 bald eagle communal winter night roosts located in the county.

There are six bald eagle wintering concentrations located in the county at Lummi Island, Nooksack River-Bellingham Bay, and along the Nooksack River.

There are 48 bald eagle nesting territories located in the county. Nesting activities occur from about January 1 through August 15.

Brown pelicans (*Pelecanus occidentalis*) occur in Lummi Bay in the county.

Bull trout (*Salvelinus confluentus*) occur in the county.

Canada lynx (*Lynx canadensis*) may occur in the county.

Gray wolves (*Canis lupus*) may occur in the county.

Grizzly bears (*Ursus arctos = U. a. horribilis*) may occur in the county.

Marbled murrelets (*Brachyramphus marmoratus*) occur in the county.

Northern spotted owls (*Strix occidentalis caurina*) occur in the county throughout the year.

Major concerns that should be addressed in your biological assessment of the project impacts to listed species include:

1. Level of use of the project area by listed species;
2. Effect of the project on listed species' primary food stocks, prey species, and foraging areas in all areas influenced by the project; and
3. Impacts from project construction (i.e., habitat loss, increased noise levels, increased human activity) that may result in disturbance to listed species and/or their avoidance of the project area.

DESIGNATED

Critical habitat for the northern spotted owl has been designated in Whatcom County.
Critical habitat for the marbled murrelet has been designated in Whatcom County.

PROPOSED

None

CANDIDATE

Yellow-billed cuckoo (*Coccyzus americanus*)

SPECIES OF CONCERN

California wolverine (*Gulo gulo luteus*)
Cascades frog (*Rana cascadae*)
Long-eared myotis (*Myotis evotis*)
Long-legged myotis (*Myotis volans*)
Northern goshawk (*Accipiter gentilis*)
Olive-sided flycatcher (*Contopus cooperi*)
Pacific fisher (*Martes pennanti pacifica*)
Pacific lamprey (*Lampetra tridentata*)
Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*)
Peregrine falcon (*Falco peregrinus*)
River lamprey (*Lampetra ayresi*)
Tailed frog (*Ascaphus truei*)
Western gray squirrel (*Sciurus griseus griseus*)
Botrychium ascendens (triangular-lobed moonwort)

ATTACHMENT B

FEDERAL AGENCIES' RESPONSIBILITIES UNDER SECTIONS 7(a) AND 7(c) OF THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED

SECTION 7(a) - Consultation/Conference

Requires:

1. Federal agencies to utilize their authorities to carry out programs to conserve endangered and threatened species;

2. Consultation with the U.S. Fish and Wildlife Service (FWS) when a Federal action may affect a listed endangered or threatened species to ensure that any action authorized, funded, or carried out by a Federal agency is not likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat. The process is initiated by the Federal agency after it has determined if its action may affect (adversely or beneficially) a listed species; and

3. Conference with the FWS when a Federal action is likely to jeopardize the continued existence of a proposed species or result in destruction or an adverse modification of proposed critical habitat.

SECTION 7(c) - Biological Assessment for Construction Projects *

Requires Federal agencies or their designees to prepare a Biological Assessment (BA) for construction projects only. The purpose of the BA is to identify any proposed and/or listed species that is/are likely to be affected by a construction project. The process is initiated by a Federal agency in requesting a list of proposed and listed threatened and endangered species (list attached). The BA should be completed within 180 days after its initiation (or within such a time period as is mutually agreeable). If the BA is not initiated within 90 days of receipt of the species list, please verify the accuracy of the list with the Service. No irreversible commitment of resources is to be made during the BA process which would result in violation of the requirements under Section 7(a) of the Act. Planning, design, and administrative actions may be taken; however, no construction may begin.

To complete the BA, your agency or its designee should (1) conduct an onsite inspection of the area to be affected by the proposal, which may include a detailed survey of the area to determine if the species is present and whether suitable habitat exists for either expanding the existing population or potential reintroduction of the species; (2) review literature and scientific data to determine species distribution, habitat needs, and other biological requirements; (3) interview experts including those within the FWS, National Marine Fisheries Service, state conservation department, universities, and others who may have data not yet published in scientific literature; (4) review and analyze the effects of the proposal on the species in terms of individuals and populations, including consideration of cumulative effects of the proposal on the species and its habitat; (5) analyze alternative actions that may provide conservation measures; and (6) prepare a report documenting the results, including a discussion of study methods used, any problems encountered, and other relevant information. Upon completion, the report should be forwarded to our Endangered Species Division, 510 Desmond Drive SE, Suite 102, Lacey, WA 98503-1273.

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* "Construction project" means any major Federal action which significantly affects the quality of the human environment (requiring an EIS), designed primarily to result in the building or erection of human-made structures such as dams, buildings, roads, pipelines, channels, and the like. This includes Federal action such as permits, grants, licenses, or other forms of Federal authorization or approval which may result in construction.

1889

STATE OF WASHINGTON
DEPARTMENT OF FISH AND WILDLIFE
Mailing Address: 600 Capitol Way N – Olympia, Washington 98501-1091 – (360) 902-2200, TDD (360) 902-2207
Main Office Location: Natural Resources Building – 1111 Washington Street SE – Olympia, WA

July 18, 2003

Roy Zipp
North Cascades National Park
7280 Ranger Station Road
Marblemount, Washington 98267

Dear Mr. Zipp:

Enclosed is the information we discussed on the telephone on Wednesday, July 17, 2003. I included more than you probably need. The additional information may help you understand how we process Environmental Impact Statements (EISs). It does not mean that you will need to follow our procedures.

The two sections that concern you for the EIS you are preparing is the list of Elements of the Environment (WAC 197-11-444) and the approach to alternatives and mitigation expectations (WAC 197-11-442(5) and (6)). Remember, this is a non-project action as defined by SEPA because it is a programmatic EIS concerning the overall impacts from fish stocking in high lakes, rather than the actual stocking of a specific lake (a project action). There is a little more flexibility for a non-project action, but as I stated on the phone, often local issues may get overlooked in a NEPA document.

While some issues are not significant enough to be mentioned in a NEPA EIS, there may be some specific items that do cause concern. An obvious example would be if a National Park decided to spray Bt along their borders to prevent gypsy moth infestation. The County may have designated in their Comprehensive Plan a critical area along side one of those parks whereby they were protecting a prairie habitat that sustained state candidate butterflies. Another example is that the Park may decide to open access to tour groups, but the road into the park is a two-lane road by a school.

It doesn't look like this programmatic will trigger local issues, but look over the documents I have enclosed to be sure. I also sent information as to how SEPA adopts a NEPA document. If it is an EIS, it is fairly straight-forward in that, once determined that the NEPA EIS is adequate (and has not been appealed unfavorably or has not received a poor rating by EPA), then the adoption may be completed with a seven-day waiting period before action occurs. This means

Roy Zipp
July 18, 2003
Page 2

a review period is not necessary because the NEPA EIS has already been sent our for review. An Environmental Assessment, on the other hand, does require a SEPA review period (usually 14 days, but could be longer).

I hope this information will help you with the EIS. If you need to contact me, my phone number is (360) 902-2575. I can also be reached by e-mail at prattcrp@dfw.wa.gov. Please keep me informed as to the progress of the EIS. I will need to review it after it is final so that I can adopt it.

Sincerely,

Cynthia R. Pratt

Cynthia R. Pratt
SEPA/NEPA Coordinator
Habitat Program

Enclosures

cc: Rich Costello, RHPM, Region 4

Canada
Mt. Baker Wilderness
Mt. Shuksan
North C
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Baker Lake
Skagit River
Marblemount
Sauk River
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Boulder River Wilderness
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Appendix D

Related Regulations, Policies, Laws, and Legislation

APPENDIX D: RELATED REGULATIONS, POLICIES, LAWS, AND LEGISLATION

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APPENDIX D: RELATED REGULATIONS, POLICIES, LAWS, AND LEGISLATION

GENERAL LAWS RELATING TO NPS MANAGEMENT

This section is intended to highlight the existing laws, regulations, and National Park Service (NPS) management policies that specifically relate to the issues surrounding this *North Cascades National Park Service Complex Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS).

1. **National Parks Omnibus Management Act of 1998 (16 USC § 5931, et. seq.)**

   16 USC§ 5931, Purposes
   The purposes of this title are
   (1) to more effectively achieve the mission of the National Park Service; (2) to enhance management and protection of national park resources by providing clear authority and direction for the conduct of scientific study in the National Park System and to use the information gathered for management purposes; (3) to ensure appropriate documentation of resource conditions in the National Park System; (4) to encourage others to use the National Park System for study to the benefit of park management as well as broader scientific value, where such study is consistent with the Act of August 25, 1916 (commonly known as the National Park Service Organic Act); and (5) to encourage the publication and dissemination of information derived from studies in the National Park System.

   16 USC § 5932, Research mandate
   The Secretary is authorized and directed to assure that management of units of the National Park System is enhanced by the availability and utilization of a broad program of the highest quality science and information.

   16 USC § 5936, Integration of study results into management decisions
   The Secretary shall take such measures as are necessary to assure the full and proper utilization of the results of scientific study for park management decisions. In each case in which an action undertaken by the National Park Service may cause a significant adverse effect on a park resource, the administrative record shall reflect the manner in which unit resource studies have been considered. The trend in the condition of resources of the National Park System shall be a significant factor in the annual performance evaluation of each superintendent of a unit of the National Park System.

2. **1978 Redwood Amendment, which added these words to the NPS Organic Act (16 USC § 1a-1)**

   Congress further reaffirms, declares, and directs that the promotion and regulation of the various areas of the National Park System, as defined in section 2 of this Act, shall be consistent with and founded in the purpose established by the first section of the Act of August 25, 1916, to the common benefit of all the people of the United States. The authorization of activities shall be construed and the protection, management, and administration of these areas shall be conducted in light of the high public value and integrity of the National Park System and shall not be exercised in derogation of the values and purposes for which these various areas have been established, except as may have been or shall be directly and specifically provided by Congress.

3. Code of Federal Regulations

36 CFR § 1.2, Applicability and scope

(a) The regulations contained in this chapter apply to all persons entering, using, visiting, or otherwise within:
(1) The boundaries of federally owned lands and waters administered by the National Park Service; (2) The boundaries of lands and waters administered by the National Park Service for public-use purposes pursuant to the terms of a written instrument; (3) Waters subject to the jurisdiction of the United States located within the boundaries of the National Park System, including navigable waters and areas within their ordinary reach (up to the mean high water line in places subject to the ebb and flow of the tide and up to the ordinary high water mark in other places) and without regard to the ownership of submerged lands, tidelands, or lowlands;
(d) The regulations contained in parts 2 through 5, part 7, and part 13 of this section shall not be construed to prohibit administrative activities conducted by the National Park Service, or its agents, in accordance with approved general management and resource management plans, or in emergency operations involving threats to life, property, or park resources.

36 CFR § 1.5, Closures and public use limits

(a) Consistent with applicable legislation and Federal administrative policies, and based upon a determination that such action is necessary for the maintenance of public health and safety, protection of environmental or scenic values, protection of natural or cultural resources, aid to scientific research, implementation of management responsibilities, equitable allocation and use of facilities, or the avoidance of conflict among visitor use activities, the superintendent may:
(1) Establish, for all or a portion of a park area, a reasonable schedule of visiting hours, impose public use limits, or close all or a portion of a park area to all public use or to a specific use or activity. (2) Designate areas for a specific use or activity, or impose conditions or restrictions on a use or activity. (3) Terminate a restriction, limit, closure, designation, condition, or visiting hour restriction imposed under paragraph (a)(1) or (2) of this section.

(b) Except in emergency situations, a closure, designation, use or activity restriction or condition, or the termination or relaxation of such, which is of a nature, magnitude and duration that will result in a significant alteration in the public use pattern of the park area, adversely affect the park's natural, aesthetic, scenic or cultural values, require a long-term or significant modification in the resource management objectives of the unit, or is of a highly controversial nature, shall be published as rulemaking in the Federal Register.

(c) Except in emergency situations, prior to implementing or terminating a restriction, condition, public use limit or closure, the superintendent shall prepare a written determination justifying the action. That determination shall set forth the reason(s) the restriction, condition, public use limit or closure authorized by paragraph (a) has been established, and an explanation of why less restrictive measures will not suffice, or in the case of a termination of a restriction, condition, public use limit or closure previously established under paragraph (a), a determination as to why the restriction is no longer necessary and a finding that the termination will not adversely impact park resources. This determination shall be available to the public upon request.

(d) To implement a public use limit, the superintendent may establish a permit, registration, or reservation system. Permits shall be issued in accordance with the criteria and procedures of § 1.6 of this chapter.

(e) Except in emergency situations, the public will be informed of closures, designations, and use or activity restrictions or conditions, visiting hours, public use limits, public use limit procedures, and the termination or relaxation of such, in accordance with § 1.7 of this chapter.

(f) Violating a closure, designation, use or activity restriction or condition, schedule of visiting hours, or public use limit is prohibited.

36 CFR § 1.7, Public notice
(a) Whenever the authority of § 1.5(a) is invoked to restrict or control a public use or activity, to relax or revoke an existing restriction or control, to designate all or a portion of a park area as open or closed, or to require a permit to implement a public use limit, the public shall be notified by one or more of the following methods:

(1) Signs posted at conspicuous locations, such as normal points of entry and reasonable intervals along the boundary of the affected park locale. (2) Maps available in the office of the superintendent and other places convenient to the public. (3) Publication in a newspaper of general circulation in the affected area. (4) Other appropriate methods, such as the removal of closure signs, use of electronic media, park brochures, maps and handouts.

(b) In addition to the above-described notification procedures, the superintendent shall compile in writing all the designations, closures, permit requirements and other restrictions imposed under discretionary authority. This compilation shall be updated annually and made available to the public upon request.

FEDERAL LAWS AND NPS MANAGEMENT POLICIES RELATING TO FISH STOCKING (EXOTIC SPECIES)

1. Code of Federal Regulations

36 CFR § 2.1, Preservation of natural, cultural and archeological resources
(a) Except as otherwise provided in this chapter, the following is prohibited:
(1) Possessing, destroying, injuring, defacing, removing, digging, or disturbing from its natural state: (i) Living or dead wildlife or fish, or the parts or products thereof, such as antlers or nests.

(2) Introducing wildlife, fish or plants, including their reproductive bodies, into a park area ecosystem.

2. NPS Management Policies

4.1.5 Restoration of Natural Systems
The Service will re-establish natural functions and processes in human-disturbed components of natural systems in parks unless otherwise directed by Congress. Landscapes disturbed by natural phenomena, such as landslides, earthquakes, floods, hurricanes, tornadoes, and fires, will be allowed to recover naturally unless manipulation is necessary to protect park developments or visitor safety. Impacts to natural systems resulting from human disturbances include the introduction of exotic species; the contamination of air, water, and soil; changes to hydrologic patterns and sediment transport; the acceleration of erosion and sedimentation; and the disruption of natural processes. The Service will seek to return human-disturbed areas

to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated. The Service will use the best available technology, within available resources, to restore the biological and physical components of these systems, accelerating both their recovery and the recovery of landscape and biological-community structure and function. Efforts may include, for example:

- Removal of exotic species;
- Removal of contaminants and non-historic structures or facilities;
- Restoration of abandoned mineral lands, abandoned or unauthorized roads, areas over-grazed by domestic animals, or disrupted natural waterways and/ or shoreline processes;
- Restoration of areas disturbed by NPS administrative, management, or development activities (such as hazard tree removal, construction, or sand and gravel extraction) or by public use;
- Restoration of natural soundscapes; and
- Restoration of native plants and animals.

When park development is damaged or destroyed and replacement is necessary, the development will be replaced or relocated so as to promote the restoration of natural resources and processes.

(*See Decision-making Requirements to Avoid Impairments 1.4.7; Restoration of Native Plant and Animal Species 4.4.2.2; Management of Natural Landscapes 4.4.2.4; Siting Facilities to Avoid Natural Hazards 9.1.1.6. Also see Director's Order #18: Wildland fire Management*)

4.4.1.1 Plant and Animal Population Management Principles

The individual plants and animals found within parks are genetically parts of species populations that may extend across both park and non-park lands. As local populations within a group of populations naturally fluctuate in size, they become vulnerable to natural or human-caused extirpation during periods when their numbers are low. The periodic disappearance of local populations is common in some species, and the regional persistence of these species depends upon the natural recolonization of suitable habitat by individuals from the remaining local populations. Thus, providing for the persistence of a species in a park may require maintaining a number of local populations, often both within and outside the park.

In addition, some populations of vertebrate and invertebrate animals, such as bats, caribou, warblers, marine turtles, frogs, salmon, whales, and butterflies, migrate at regular intervals into and out of parks. For these migratory populations, the parks provide only one of the several major habitats they need, and survival of the species in parks also depends on the existence and quality of habitats outside the parks. The Service will adopt park resource preservation, development, and use management strategies that are intended to maintain the natural population fluctuations and processes that influence the dynamics of individual plant and animal populations, groups of plant and animal populations, and migratory animal populations in parks.

In addition to maintaining all native plant and animal species and their habitats inside parks, the Service will work with other land managers to encourage the conservation of the populations and habitats of these species outside parks whenever possible. To meet its commitments for maintaining native species in parks, the Service will cooperate with states, tribal governments, the U.S. Fish and Wildlife Service, and the National Marine fisheries Service, as appropriate, to:

- Participate in local and regional scientific and planning efforts, identify ranges of populations of native plants and animals, and develop cooperative strategies for maintaining or restoring these populations in the parks;
- Suggest mutually beneficial harvest regulations for lands and waters outside the parks for populations that extend across park boundaries, such as resident deer or fishes; for short-distance seasonal migrant populations, such as elk or fishes; or for long-distance migrant populations, such as salmon;
- Develop data, through monitoring, for use in plant and animal management programs (such as local land management decision-making for assessing resident plant and animal population trends, and in international management negotiations for such far-ranging seasonal migrants as geese, whales, and marine turtles);
- Present information about species life cycles, ranges, and population dynamics in park interpretive programs for use in increasing public awareness of management needs for all species, both resident and migrant, that occur in parks; and
- Prevent the introduction of exotic species into units of the National Park System, and remove populations of these species that have already become established in parks.

4.4.3 Harvest of Plants and Animals by the Public

Public harvesting of designated species of plants and animals, or their components, may be allowed in park units when:

- Hunting, trapping, subsistence use, or other harvesting is specifically authorized by statute or regulation and not subsequently prohibited by regulation;
- Harvest of certain plant parts or unoccupied seashells for personal consumption or use is specifically authorized by the superintendent in accordance with 36 CFR 2. 1(c)(1);
- Recreational fishing is not specifically prohibited; or
- Commercial fishing is specifically authorized by statute or regulation.

Where harvesting is allowed and subject to NPS control, the Service will allow harvesting only when the monitoring requirement contained in section 4.4.2 and the criteria in section 4.4.2.1, above, have been met, and the Service has determined that the harvesting will not unacceptably impact park resources or natural processes, including the natural distributions, densities, age-class distributions, and behavior of:

- Harvested species;
- Native species that the harvested species use for any purpose; or
- Native species that use the harvested species for any purpose.

The Service will manage harvesting programs, and any associated habitat management programs intended to restore and maintain habitats supporting harvested plant or animal populations, to conform with applicable federal and state regulations and in consultation and cooperation, as appropriate, with individual states or tribal governments.

Habitat manipulation for harvested species may include the restoration of a disturbed area to its natural condition so it can become self-perpetuating, but will not include the artificial manipulation of habitat to increase the numbers of a harvested species above its natural range in population levels.

The Service may encourage the intensive harvesting of exotic species in certain situations when needed to meet park management objectives.

In some situations, the Park Service may stock native or exotic animals for recreational harvesting purposes, but only when such stocking will not impair park natural resources or processes, and:

- The stocking is of fish into constructed large reservoirs or other significantly altered large water bodies and the purpose is to provide for recreational fishing; or
- Such stocking is in a national recreation area or preserve that has historically been stocked (in these situations, stocking only of the same species may be continued); or
- Congressional intent for stocking is expressed in statute or a House or Senate report accompanying a statute.

The Service will not stock waters that are naturally barren of harvested aquatic species.

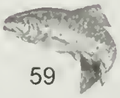
4.4.4 Management of Exotic Species

Exotic species will not be allowed to displace native species if displacement can be prevented.

4.4.4.1 Introduction or Maintenance of Exotic Species

In general, new exotic species will not be introduced into parks. In rare situations, an exotic species may be introduced or maintained to meet specific, identified management needs when all feasible and prudent measures to minimize the risk of harm have been taken, and it is:

- A closely related race, subspecies, or hybrid of an extirpated native species; or
- An improved variety of a native species in situations in which the natural variety cannot survive current, human-altered environmental conditions; or Used to control another, already-established exotic species; or
- Needed to meet the desired condition of a historic resource, but only where it is prevented from being invasive by such means as cultivating (for plants), or tethering, herding, or pasturing (for animals). In such cases, the exotic species used must be known to be historically significant, to have existed in the park during the park's period of historical significance, or to have been commonly used in the local area at that time; or
- An agricultural crop used to maintain the character of a cultural landscape; or



- Necessary to provide for intensive visitor use in developed areas, and both of the following conditions exist:
  - Available native species will not meet park management objectives; and
  - The exotic species is managed so it will not spread or become a pest on park or adjacent lands; or
- A sterile, non-invasive plant that is used temporarily for erosion control; or
- Directed by law or expressed legislative intent.

Domestic livestock such as cattle, sheep, goats, horses, mules, burros, reindeer, and llamas are exotic species that are maintained in some parks for purposes of commercial herding, pasturing, grazing, or trailing; for recreational use; or for administrative use for maintaining the historic scene or supporting park operations. The policies applicable to the grazing of commercial domestic livestock are discussed in chapter 8, section 8. 6. 8. The Service will phase out the commercial grazing of livestock whenever possible, and will manage recreational and administrative uses of livestock to prevent those uses from unacceptably impacting park natural resources.

4.4.4.2 Removal of Exotic Species Already Present

All exotic plant and animal species that are not maintained to meet an identified park purpose will be managed— up to and including eradication— if (1) control is prudent and feasible, and (2) the exotic species:

- Interferes with natural processes and the perpetuation of natural features, native species or natural habitats; or
- Disrupts the genetic integrity of native species; or
- Disrupts the accurate presentation of a cultural landscape; or
- Damages cultural resources; or
- Significantly hampers the management of park or adjacent lands; or
- Poses a public health hazard as advised by the U. S. Public Health Service (which includes the Centers for Disease Control and the NPS Public Health Program); or
- Creates a hazard to public safety.

High priority will be given to managing exotic species that have, or potentially could have, a substantial impact on park resources, and that can reasonably be expected to be successfully controllable. Lower priority will be given to exotic species that have almost no impact on park resources or that probably cannot be successfully controlled.

The decision to initiate management should be based on a determination that the species is exotic. For species determined to be exotic and where management appears to be feasible and effective, superintendents should (1) evaluate the species' current or potential impact on park resources; (2) develop and implement exotic species management plans according to

established planning procedures; (3) consult, as appropriate, with federal and state agencies; and (4) invite public review and comment, where appropriate. Programs to manage exotic species will be designed to avoid causing significant damage to native species, natural ecological communities, natural ecological processes, cultural resources, and human health and safety.
(Also see Executive Order # 13112 (Invasive Species))

FEDERAL LAWS AND NPS MANAGEMENT POLICIES RELATING TO WILDERNESS AREAS

1. The Wilderness Act (16 USC § 1131, et. seq.)

16 USC § 1131
(a) it is hereby declared to be the policy of the Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness. For this purpose there is hereby established a National Wilderness Preservation System to be composed of federally owned areas designated by Congress as "wilderness areas", and these shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness; and no Federal lands shall be designated as "wilderness areas" except as provided for in this Act or by a subsequent Act.

(c) Definition of wilderness. A wilderness, in contrast with those areas where man and his own works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain. An area of wilderness is further defined to mean in this Act an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation, which is protected and managed so as to preserve its natural conditions and which (1) generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable; (2) has outstanding opportunities for solitude or a primitive and unconfined type of recreation; (3) has at least five thousand acres of land or is of sufficient size as to make practicable its preservation and use in an unimpaired condition; and (4) may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value.

16 USC § 1133, Use of wilderness areas
(a) Purposes of national forests, national park system, and national wildlife refuge system; other provisions applicable to national forests, Superior National Forest, and national park system. The purposes of this Act are hereby declared to be within and supplemental to the purposes for which national forests and units of the national park and national wildlife refuge systems are established and administered and—
(3) Nothing in this Act shall modify the statutory authority under which units of the national park system are created. Further, the designation of any area of any park, monument, or other unit of the national park system as a wilderness area pursuant to this Act shall in no manner lower the standards evolved for the use and preservation of such park, monument, or other unit of the national park system in accordance with the Act of August 25, 1916, the statutory authority under which the area was created, or any other Act of Congress which might pertain

to or affect such area, including, but not limited to, the Act of June 8, 1906 (34 Stat. 225); section 3(2) of the Federal Power Act; and the Act of August 21, 1935 (49 Stat. 666)

(b) Agency responsibility for preservation and administration to preserve wilderness character; public purposes of wilderness areas. Except as otherwise provided in this Act each agency administering any area designated as wilderness shall be responsible for preserving the wilderness character of the area and shall so administer such area for such other purposes for which it may have been established as also to preserve its wilderness character. Except as otherwise provided in this Act, wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use.

(c) Prohibition provisions: commercial enterprise, permanent or temporary roads, mechanical transports, and structures or installations; exceptions: area administration and personal health and safety emergencies. Except as specifically provided for in this Act and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and, except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area.

(d) Special provisions. The following special provisions are hereby made:
(1) Aircraft or motorboats; fire, insects, and diseases. Within wilderness areas designated by this Act the use of aircraft or motorboats, where these uses have already become established, may be permitted to continue subject to such restrictions as the Secretary of Agriculture deems desirable. In addition, such measures may be taken as may be necessary in the control of fire, insects, and diseases, subject to such conditions as the Secretary deems desirable.
(2) Mineral activities, surveys for mineral value. Nothing in this Act shall prevent within national forest wilderness areas any activity, including prospecting, for the purpose of gathering information about mineral or other resources, if such activity is carried on in a manner compatible with the preservation of the wilderness environment. Furthermore, in accordance with such program as the Secretary of the Interior shall develop and conduct in consultation with the Secretary of Agriculture, such areas shall be surveyed on a planned, recurring basis consistent with the concept of wilderness preservation by the [United States] Geological Survey and the [United States] Bureau of Mines to determine the mineral values, if any, that may be present; and the results of such surveys shall be made available to the public and submitted to the President and Congress.

(6) State water laws exemption. Nothing in this Act shall constitute an express or implied claim or denial on the part of the Federal Government as to exemption from State water laws.
(7) State jurisdiction of wildlife and fish in national forests. Nothing in this Act shall be construed as affecting the jurisdiction or responsibilities of the several States with respect to wildlife and fish in the national forests.

2. NPS Management Policies Relating to Wilderness Areas

6.1 General Statement

The National Park Service will manage wilderness areas for the use and enjoyment of the American people in such a manner as will leave them unimpaired for future use and

enjoyment as wilderness. Management will include the protection of these areas, the preservation of their wilderness character, and the gathering and dissemination of information regarding their use and enjoyment as wilderness. The public purpose of wilderness in the national parks includes the preservation of wilderness character and wilderness resources in an unimpaired condition, as well as for the purposes of recreational, scenic, scientific, education, conservation, and historical use.

6.3.1 Wilderness Resource Management, General Policy

For the purposes of applying these policies, the term "wilderness" will include the categories of suitable, study, proposed, recommended, and designated wilderness. Potential wilderness may be a subset of any of these five categories. The policies apply regardless of category. In addition to managing these areas for the preservation of the physical wilderness resources, planning for these areas must ensure that the wilderness character is likewise preserved. This policy will be applied to all planning documents affecting wilderness. The National Park Service will take no action that would diminish the wilderness suitability of an area possessing wilderness characteristics until the legislative process of wilderness designation has been completed. Until that time, management decisions pertaining to lands qualifying as wilderness will be made in expectation of eventual wilderness designation. This policy also applies to potential wilderness, requiring it to be managed as wilderness to the extent that existing non-conforming conditions allow. The National Park Service will seek to remove from potential wilderness the temporary, nonconforming conditions that preclude wilderness designation. All management decisions affecting wilderness will further apply the concepts of "minimum requirements" for the administration of the area regardless of wilderness category.

6.3.4.3 Environmental Compliance

Proposals having the potential to impact wilderness resources will be evaluated in accordance with National Park Service procedures for implementing NEPA. Those procedures include the use of categorical exclusions, environmental assessments (EAs), and/ or environmental impact statements (EISs). Administrative actions impacting wilderness must be addressed in either the EA or EIS accompanying the approved wilderness management plan, or as a separate environmental compliance document. Managers contemplating the use of aircraft or other motorized equipment or mechanical transportation within wilderness must consider impacts to the character, esthetics, and traditions of wilderness before considering the costs and efficiency of the equipment. In evaluating environmental impacts, the National Park Service will take into account wilderness characteristics and values, including the primeval character and influence of the wilderness; the preservation of natural conditions (including the lack of man-made noise); and assurances that there will be outstanding opportunities for solitude, that the public will be provided with a primitive and unconfined type of recreational experience, and that wilderness will be preserved and used in an unimpaired condition. Managers will be expected to appropriately address cultural resources management considerations in the development and review of environmental compliance documents impacting wilderness resources.

6.3.5 Minimum Requirement

All management decisions affecting wilderness must be consistent with the minimum requirement concept. This concept is a documented process used to determine whether administrative activities affecting wilderness resources or the visitor experience are necessary, and how to minimize impacts. The minimum requirement concept will be applied as a two-step process that determines:

- Whether the proposed management action is appropriate or necessary for administration of the area as wilderness and does not pose a significant impact to wilderness resources and character; and the techniques and types of equipment needed to ensure that impact to wilderness resources and character is minimized.

- In accordance with this policy, superintendents will apply the minimum requirement concept to the context of wilderness management planning, as well as to all other administrative practices, proposed special uses, scientific activities, and equipment use in wilderness. When determining minimum requirement, the potential disruption of wilderness character and resources will be considered before, and given significantly more weight than, economic efficiency and convenience. If a compromise of wilderness resources or character is unavoidable, only those actions that preserve wilderness character and/ or have localized, short-term adverse impacts will be acceptable.

While park managers have flexibility in identifying the method used to determine minimum requirement within the approved wilderness management plan, the method used must clearly weigh the benefits and impacts of the proposal, document the decision-making process, and be supported by an appropriate environmental compliance document. Parks with no approved wilderness management plan must develop a separate process to determine minimum requirement until the plan is finally approved. Parks will complete a minimum requirement analysis on those administrative practices and equipment uses that have the potential to impact wilderness resources or values. The minimum requirement concept cannot be used to rationalize permanent roads or inappropriate or unlawful uses in wilderness.

Administrative use of motorized equipment or mechanical transport will be authorized only:

- If determined by the superintendent to be the minimum requirement needed by management to achieve the purposes of the area as wilderness, including the preservation of wilderness character and values; or

- In emergency situations (search and rescue) involving the health or safety of persons actually within the area. Such management activities will be conducted in accordance with all applicable regulations, policies, and guidelines, including minimum requirement protocols as practicable.

Such management activities will also be conducted in accordance with all applicable regulations, policies, and guidelines and, where practicable, will be scheduled to avoid creating adverse resource impacts or conflicts with visitor use.

6.3.7 Natural Resources Management

The National Park Service recognizes that wilderness is a composite resource with interrelated parts. Without natural resources, especially indigenous and endemic species, a wilderness experience would not be possible. Natural resources are critical, defining elements of the wilderness resource, but need to be managed within the context of the whole ecosystem. Natural resource management plans will be integrated with, and cross-reference, wilderness management plans. Pursuing a series of independent component projects in wilderness, such as single-species management, will not necessarily accomplish the over-arching goal of wilderness management. Natural resources management in wilderness will include and be guided by a coordinated program of scientific inventory, monitoring, and research.

The principle of non-degradation will be applied to wilderness management, and each wilderness area's condition will be measured and assessed against its own unimpaired standard. Natural processes will be allowed, insofar as possible, to shape and control wilderness ecosystems. Management should seek to sustain the natural distribution, numbers, population composition, and interaction of indigenous species. Management intervention should only be undertaken to the extent necessary to correct past mistakes, the impacts of human use, and influences originating outside of wilderness boundaries.

Management actions, including the restoration of extirpated native species, the altering of natural fire regimes, the controlling of invasive alien species, the management of endangered species, and the protection of air and water quality, should be attempted only when the knowledge and tools exist to accomplish clearly articulated goals.

6.3.10.2 Trails in Wilderness

Trails will be permitted within wilderness when they are determined to be necessary for resource protection and/ or for providing for visitor use for the purposes of wilderness. The identification and inventory of the wilderness trail system will be included as an integral part of the wilderness management plan or other appropriate planning document. Trails will be maintained at levels and conditions identified within the approved wilderness management plan or other planning document. Trail maintenance structures (e. g., waterbars, gabions) may be provided, under minimum requirement protocols, where they are essential for resource preservation, or where significant safety hazards exist during normal use periods. Historic and/ or prehistoric trails will be administered in keeping with approved cultural resource and wilderness management plan requirements.

Borrow pits are not permitted in wilderness areas, with the exception of small-quantity use of borrow material for trails, which must be in accordance with an approved wilderness management plan.

6.4 Wilderness Use Management

The National Park Service will encourage and facilitate those uses of wilderness that are in keeping with the definitions and purposes of wilderness and do not degrade wilderness resources and character. Appropriate restrictions may be imposed on any authorized activity in the interest of preserving wilderness character and resources or to ensure public safety.

When resource impacts or demands for use exceed established thresholds or capacities, superintendents may limit or redirect use. Physical alterations, public education, general regulations, special regulations, and permit systems, as well as local restrictions, public use limits, closures, and designations implemented under the discretionary authority of the superintendent (36 CFR 1. 5 and Part 13; 43 CFR Part 36 for Alaska units), may all be used in managing use and protecting wilderness, if these actions are determined to be the minimally required level of management.

6.4.1 Wilderness Use Management, General Policy

Park visitors need to accept wilderness on its own unique terms. Accordingly, the National Park Service will promote education programs that encourage wilderness users to understand and be aware of certain risks, including possible dangers arising from wildlife, weather conditions, physical features, and other natural phenomena that are inherent in the various conditions that comprise a wilderness experience and primitive methods of travel. The National Park Service will not modify the wilderness area to eliminate risks that are normally associated with wilderness, but it will strive to provide users with general information concerning possible risks, any recommended precautions, related user responsibilities, and applicable restrictions and regulations, including those associated with ethno-graphic and cultural resources.

6.4.3 Recreational Use Management in Wilderness

Recreational uses of National Park Service wilderness are generally those traditionally associated with wilderness and identified by Congress in the legislative record for the development of the Wilderness Act and in keeping with the language provided by sections 2(a) and 2(c) of the Act itself (16 USC 1131 (a) and (c)). These recreational uses of wilderness will be of a type and nature that ensure that its use and enjoyment will leave it unimpaired for future use and enjoyment as wilderness, provide for the protection of the area as wilderness, and provide for the preservation of wilderness character. Recreational uses in National Park Service wilderness areas will be of a nature that enable the areas to retain their primeval character and influence; protect and preserve natural conditions; leave the imprint of man's work substantially unnoticeable; provide outstanding opportunities for solitude or primitive and unconfined types of recreation; and preserve wilderness in an unimpaired condition.

6.4.3.1 Recreation Use Evaluation

Recreational uses—particularly new and emerging activities, that compromise the stated purposes and definitions of wilderness or unduly impact the wilderness resource or the visitor experience within wilderness—will be evaluated to determine if these uses are appropriate, or should be limited or disallowed through use of the superintendent's compendium in 36 CFR 1.5. Evaluation or re-evaluation should be accomplished within wilderness management plans or similar implementation plans. Recreational uses that do not meet the purposes and definitions of wilderness should be prohibited in NPS wilderness.

Significant changes in patterns or increased levels of use will not be authorized by special permit, administrative discretion, or authorities under the superintendents' compendia, except in cases where sufficient information exists to adequately determine there is no significant impact on wilderness resources and values, including visitor experiences. These increased levels of use and changes in patterns of existing use will normally not qualify for a categorical exclusion under NEPA. Decisions regarding significant changes in patterns and new levels of use will require environmental analysis and review, including opportunity for public comment, in accordance with the requirements of NEPA.

6.4.3.3 Use of Motorized Equipment

Public use of motorized equipment or any form of mechanical transport will be prohibited in wilderness except as provided for in specific legislation. Operating a motor vehicle or possessing a bicycle in designated wilderness outside Alaska is prohibited (see NPS regulations in 36 CFR 4. 30(d)(1)).

However, section 4(d)(1) of the Wilderness Act (16 USC 1133(d)(1)) authorizes the Secretary, where legislation designating the wilderness specifically makes this provision applicable, to allow the continuation of motorboat and aircraft use under certain circumstances in which those activities were established prior to wilderness designation. Section 4(d)(1) gives the Secretary the discretion to manage and regulate the activity in accordance with the Wilderness Act, the NPS Organic Act, and individual park enabling legislation. As authorized, the National Park Service will administer this use to be compatible with the purpose, character, and resource values of the particular wilderness area involved. The use of motorized equipment by the public in wilderness areas in Alaska is governed by

applicable provisions of ANILCA, NPS regulations in 36 CFR part 13, and Department of the Interior regulations in 43 CFR part 36. The specific conditions under which motorized equipment may be used by the public will be outlined in each park's wilderness management plan.

6.4.6 Existing Private Rights

Wilderness designation does not extinguish valid existing private rights (e. g., fee-simple interest, less-than-fee-simple interest, valid mineral operations, rights-of-way, grazing permits). The validity of private rights within wilderness must be determined on a case-by-case basis. Valid private rights in wilderness must be administered in keeping with the specific conditions and requirements of the valid right.

3. NPS Management Policies Relating to Recreational Use

8.2.2 Recreational Activities

The National Park Service will encourage, allow, or not allow recreational activities according to the criteria listed in section 8.2. Examples of recreational activities that may be encouraged or allowed include, but are not limited to, boating, camping, bicycling, fishing, hiking, horseback riding and packing, outdoor sports, picnicking, scuba diving, cross-country skiing, caving, mountain and rock climbing, and swimming. However, not all of these activities will be appropriate or allowable in all parks; that determination must be made on the basis of park-specific planning. Service-wide regulations addressing aircraft use, off-road bicycling, hang gliding, off-road vehicle use, personal watercraft, and snowmobiling require that special, park-specific regulations be developed before these uses may be allowed in parks. (Somewhat different statutory and regulatory provisions apply to snowmobile, motorboat, and aircraft use in units of the national park system in Alaska.)

8.2.2.5 Fishing

Recreational fishing will be allowed in parks when it is authorized, or not specifically prohibited, by federal law, provided that it does not jeopardize natural aquatic ecosystems or riparian zones. When fishing is allowed, it will be conducted in accordance with applicable federal laws and treaty rights, and state laws and regulations. The Service may restrict fishing activities whenever necessary to achieve management objectives outlined in a park's resource management plan or to otherwise protect park resources or public safety, unless such restrictions would violate a federal law or treaty. Before the Service issues regulations or other restrictions, representatives of appropriate tribes and state and federal agencies will be consulted to ensure that all available scientific data is considered in the decisionmaking process. Any such regulations or other restrictions will be developed with public involvement.

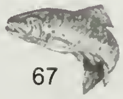
Commercial fishing will be allowed only when specifically authorized by federal law or treaty right.

PARK SPECIFIC LEGISLATION

1. Enabling Legislation

North Cascades National Park (16 U.S.C. § 90)

In order to preserve for the benefit, use, and inspiration of present and future generations certain majestic mountain scenery, snow fields, glaciers, alpine meadows, and other unique



natural features in the North Cascade Mountains of the State of Washington, there is hereby established, subject to valid existing rights, the North Cascades National Park (hereinafter referred to in this Act as the "park"). The park shall consist of the lands, waters, and interests therein within the area designated "national park" on the map entitled "Proposed Management Units, North Cascades, Washington," numbered NP-CAS-7002, and dated October 1967. The map shall be on file and available for public inspection in the office of the Director, National Park Service, Department of the Interior, and in the office of the Chief, Forest Service, Department of Agriculture.

Ross Lake National Recreation Area (16 U.S.C. § 90a)
In order to provide for the public outdoor recreation use and enjoyment of portions of the Skagit River and Ross, Diablo, and Gorge Lakes, together with the surrounding lands, and for the conservation of the scenic, scientific, historic, and other values contributing to public enjoyment of such lands and waters, there is hereby established, subject to valid existing rights, the Ross Lake National Recreation Area (hereinafter referred to in this Act as the "recreation area"). The recreation area shall consist of the lands and waters within the area designated "Ross Lake National Recreation Area" on the map referred to in section 101 of this Act.

Lake Chelan National Recreation Area (16 U.S.C., § 90b)
In order to provide for the public outdoor recreation use and enjoyment of portions of the Stehekin River and Lake Chelan, together with the surrounding lands, and for the conservation of the scenic, scientific, historic, and other values contributing to public enjoyment of such lands and waters, there is hereby established, subject to valid existing rights, the Lake Chelan National Recreation Area (hereinafter referred to in this Act as the "recreation area"). The recreation area shall consist of the lands and waters within the area designated "Lake Chelan National Recreation Area" on the map referred to in section 101 of this Act.

2. **Washington Parks Wilderness Act of 1988 (100 P.L. 668)**

An Act
To designate wilderness within Olympic National Park, Mount Rainier National Park, and North Cascades National Park Service Complex in the State of Washington, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Washington Park Wilderness Act of 1988".

TITLE II: NORTH CASCADES NATIONAL PARK SERVICE COMPLEX WILDERNESS SEC. 201. DESIGNATION

(a) WILDERNESS. -- In furtherance of the purposes of the Wilderness Act, certain lands in the North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area, Washington, which –
(1) comprise approximately six hundred and thirty-four thousand six hundred and fourteen acres of wilderness, and approximately five thousand two hundred and twenty-six acres of potential wilderness additions, and (2) are depicted on a map entitled "Wilderness Boundary, North Cascades National Park Service Complex, Washington", numbered 168-60-186 and

dated August 1988, are hereby designated as wilderness and therefore as components of the National Wilderness Preservation System. Such lands shall be known as the Stephen Mather Wilderness.

Sec. 205. Renewable Natural Resource Use in Recreation Areas

Section 402(a) of the Act of October 2, 1968 (82 Stat. 928; 16 U.S.C. 90c-1) is hereby amended to read as follows:
"The Secretary shall administer the recreation areas in a manner which in his judgment will best provide for (1) public outdoor recreation benefits and (2) conservation of scenic, scientific, historic, and other values contributing to public enjoyment. Within that portion of the Lake Chelan National Recreation Area which is not designated as wilderness, such management, utilization, and disposal of renewable natural resources and the continuation of existing uses and developments as will promote, or are compatible with, or do not significantly impair public recreation and conservation of the scenic, scientific, historic, or other values contributing to public enjoyment, are authorized. In administering the recreation areas, the Secretary may utilize such statutory authorities pertaining to the administration of the national park system, and such statutory authorities otherwise available to him for the conservation and management of natural resources as he deems appropriate for recreation and preservation purposes and for resource development compatible therewith. Within the Ross Lake National Recreation Area the removal and disposal of trees within power line rights-of-way are authorized as necessary to protect transmission lines, towers, and equipment;": Provided, That to the extent practicable, such removal and disposal of trees shall be conducted in such a manner as to protect scenic viewsheds."

Sec. 206. Mineral Resource Use in Recreation Areas

Section 402(b) of the Act of October 2, 1968 (82 Stat. 928; 16 U.S.C. 90c-1b) is hereby amended to read as follows:

"The lands within the recreation areas, subject to valid existing rights, are hereby withdrawn from all forms of appropriation or disposal under the public land laws, including location, entry, and patent under the United States mining laws, and disposition under the United States mineral leasing laws: Provided, however, That within that portion of the Lake Chelan National Recreation Area which is not designated as wilderness, sand, rock and gravel may be made available for sale to the residents of Stehekin for local use so long as such sale and disposal does not have significant adverse effects on the administration of the Lake Chelan National Recreation Area."

WASHINGTON STATE FISHING REGULATIONS

The following information is a summary of the 2004 Washington State freshwater fishing regulations. The entire pamphlet can be found at, http://www.wa.gov/wdfw/fish/regs/fishregs.htm

GENERAL RULES

- A fishing license is required for all persons 15 years or older; licenses must be carried when fishing.
- Catch record cards are required for everyone fishing for: Salmon, Sturgeon, Steelhead, Dungeness Crab, and Halibut.
- There is a prohibition against using live fish for game fish bait.
- There is a prohibition against using any chemical irritant to harvest fish.

FRESHWATER RULES

- Hook and line angling only. Barbed or barbless hooks may be used, and a hook may be single, double, or treble, but not more than one line with up to three hooks per angler may be used.
- Single barbless hooks are required in areas designated as 'fly fishing only' or 'selective gear rules.'
- All fishing gear must be kept in immediate control and may not be left unattended while fishing. Rodholders may be used but the rod must be easily removed without delay; rod may be left in holder while playing the fish. Downriggers may be used if the line releases from the downrigger while playing and landing the fish.
- A club or dipnet may be used to assist landing a legal fish taken by legal gear. A gaff hook may not be used.
- It is unlawful to chum or broadcast any substance to attract game fish, unless specifically authorized by special rules.
- Where use of bait is prohibited, or where lures or flies are used voluntarily, game fish may be caught and released until the daily limit is retained. If any fish has swallowed the hook or is hooked in the gill, eye, or tongue, it should be kept if legal to do so.

SEASONS

- Freshwater areas are open 24 hours per day when open.
- Lakes, ponds, and reservoirs are open to fishing for game fish (except Dolly Varden/Bull Trout and grass carp) year-round.
- Rivers, streams, and beaver ponds are open to fishing for game fish (except Dolly Varden/Bull Trout and grass carp) June 1 to October 31.
- An 'open' listing does not authorize anglers to trespass on private property.

STATEWIDE FRESHWATER SPECIES RULES

- *Cutthroat, Lake, and Golden Trout*

- In rivers, streams and beaver ponds minimum size is 8 inches. Daily limit is two. When fishing with bait, all trout (except steelhead) equal to or greater than the minimum size are counted as part of the daily limit whether kept or released.

- In lakes, ponds and reservoirs no minimum size. Daily limit is five. When fishing with bait, all trout (except steelhead) equal to or greater than the minimum size are counted as part of the daily limit whether kept or released.

- *Eastern Brook Trout*
  - In rivers no minimum size. Daily limit is five. Anglers may keep up to five Eastern Brook Trout, but no more than five trout total, and no more than two can be other trout species.

- *Dolly Varden/Bull Trout*
  - When listed as open under the special rules, count as part of the trout combined daily limit for rivers and lakes.

WESTSIDE RIVERS SPECIAL RULES

Special Regulations

Water	Season	Species	Catch Limit[a,b]	Minimum Size	Special Regulations
Big Beaver Creek (Beaver ponds and tributary streams)	July 1 – Oct 31	All gamefish[c]	—	—	Catch and release only.
From 1/4 mile marker upstream					Selective Gear Rules[d]
Big Beaver Creek (Beaver ponds and tributary streams) (Ross Lake to 1/4 mile upstream)	**Closed Waters**				
Cascade River	June 1 – Feb 29	Trout[e]	2	14 inches	Legal to retain Dolly Varden/bull trout as part of the Trout catch limit.
		Dolly Varden	—	20 inches	
		Other gamefish	Statewide	Statewide	
Hozomeen Lake	July 1 – Oct 31	All gamefish	Statewide	Statewide	
Newhalem Ponds	**Closed Waters**				
Nooksack River	Nov 1 – Mar 15	Trout	2	14 inches	Wild steelhead release.
Ross Lake	July 1 – Oct 31	Trout	3	13 inches	Selective Gear Rules, except motors allowed.
		All gamefish	Statewide	Statewide	All tributaries are closed from lake to 1 mile upstream, except see special rules for Big Beaver Creek and Ruby Creek.
Ruby Creek	**Closed Waters**				
Skagit River (Bacon Creek to Gorge Powerhouse)	June 1 – Feb 29	Trout	2	14 inches	Legal to retain Dolly Varden/bull trout as part of the catch limit.
		Dolly Varden	—	20 inches	All species night closure and non-buoyant lure restriction July 1 – Nov 30.
		Steelhead	—	—	
		Other gamefish	Statewide	Statewide	

Water	Season	Species	Catch Limit[a,b]	Minimum Size	Special Regulations
Skagit River (Gorge Powerhouse to Dam)	**Closed Waters**				
Stehekin River (Mouth to Agnes Creek)	Mar 1 – June 30	All gamefish	0	—	Game fish catch and release only, Selective Gear Rules.
	July 1 – Oct 31	Trout	2	15 inches	Release Cutthroat, Selective Gear Rules.
		Other gamefish	Statewide	Statewide	Selective Gear Rules.
Stetattle Creek	**Closed Waters**				
Trapper Lake	Year around	Trout	2	None	
		Other gamefish	Statewide	Statewide	

Notes:

a. Possession limit for game fish is two daily limits in any form.

b. The combined daily limit for anglers that fish in both rivers and lakes on the same day is five trout. In the combined daily limit, only two trout may be from rivers, except as provided for Eastern brook trout.

c. Game fish = bass, tiger muskellunge, walleye, whitefish, burbot, catfish, crappie, northern pike, peamouth chub, perch, suckers, sunfish, bullfrogs, and all trout.

d. Selective Gear Rules = Only unscented artificial flies or lures with one single barbless hook are allowed. Up to a total of three artificial flies or lures containing single barbless hooks may be used. Bait is prohibited; fish may be released until the daily limit is retained. No one may fish from any floating device equipped with a motor except where specifically allowed under Special Rules for individual waters. If any fish has swallowed the hook or is hooked in the gill, eye, or tongue, it should be kept if legal to do so.

e. Trout = grayling, kokanee, brown, rainbow, golden, cutthroat, and lake.

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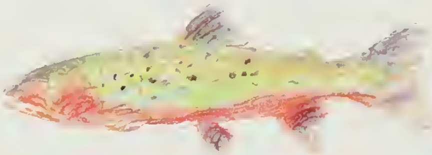


Appendix E

ATTRIBUTES TABLE

APPENDIX E: ATTRIBUTES TABLE

Reproducing Species/Strain Present – Species/strain of trout currently present and reproducing in lake. Subspecies or strain (stock) of trout species is indicated if known.

Stocked Species/Strain Present – Species/strain of stocked trout currently present in lake, but not reproducing. Assuming an approximate maximum life span of 10 years (range of 7–14 years), trout planted after 1993 (stocked in 1994 or later) are likely to currently (2003) be present in lake.

Stocked Species Scheduled for Stocking – Species/strain scheduled for planting under current WDFW management plan. Subspecies or strain (stock) of trout species is indicated if known.

Stocked Species/Strains Historically Present – All of the species/strains of trout historically planted in lake. Subspecies or strain (stock) of trout species is indicated if known.

Outside Range of Caudata – Lake is either outside range of salamander species native to North Cascades Complex or in alpine habitat without necessary habitat components to sustain a population of long-toed or northwestern salamanders.

Within Range of AMMA – Lake is within the range of distribution for long-toed salamanders and has appropriate habitat. Perennial lakes that are within the range of northwestern salamanders and have suitable habitat are assumed (with rare exceptions) to not contain a population of long-toed salamanders.

Within Range of AMGR – Lake is within the range of distribution for northwestern salamanders, has appropriate habitat, and is perennial.

AMMA or AMGR Present – Species was observed during amphibian survey of lake.

Index of Connectivity – An index of connectivity based on weighted calculations of potential salamander breeding lake (lakes within range of salamander distribution and having appropriate habitat) density (lakes/acre) within a target lake's basin (major tributary basin), Documented salamander breeding Lakes within 6 kilometers (km) (maximum colonization distance) of target lake, and number of potential salamander lakes with 0.6 km (maximum dispersal distance) of target lake. Lakes with an index of 0.7–0.9 have high connectivity; lakes with an index of 0.4–0.6 have moderate connectivity; lakes with an index of 0–0.3 have poor connectivity; and lakes with less than 0.0 index of connectivity can be considered isolated.

Abbreviations of Species/Strain Names

Oncorhynchus	This designation is used where trout of the genus *Oncorhynchus* have been stocked, but the species was not recorded.
OC = *Oncorhynchus clarki*	This is a generic designation used for cutthroat trout where the subspecies or strain is not known. Usually these fish are Twin Lake strain westslope cutthroat.
OCB = *Oncorhynchus clarki bouvieri*	Large spotted interior cutthroat trout subspecies (Yellowstone cutthroat trout) native to the Yellowstone River and Upper Snake River (above Shoshone Falls) drainages. Hatcheries in Montana were the usual broodstock source for this species. A common local name for these fish is "Montana Blackspot."
OCC = *Oncorhynchus clarki clarki*	Coastal cutthroat trout. Usually, these fish are of the "Tokul Creek" hatchery strain.
OCL = *Oncorhynchus clarki lewisi*	Westslope cutthroat trout, strain unknown. A common local name for these fish is "intermontane" cutthroat trout. This subspecies of cutthroat trout is native to the east side of the Cascade Mountains; the west sides of the Rocky Mountains from the Snake River (below Shoshone Falls), north; and the east sides of the Rocky Mountains north of the Yellowstone River.
OCL(TL) = *Oncorhynchus clarki lewisi*	Twin Lake strain westslope cutthroat. This wild strain of westslope cutthroat from Twin Lakes in Chelan County, Washington, has been the primary source of westslope cutthroat trout broodstock planted in the Cascade and Olympic mountains of Washington since 1915.
OCB(HL) = *Oncorhynchus clarki bouveri*	Henry Lake, Idaho wild strain of Yellowstone cutthroat.
OCLxOM	Westslope cutthroat/rainbow hybrid.
OM = *Oncorhynchus mykiss*	This is a generic designation used for rainbow trout where the subspecies or strain is not known.
OM(MW) = *Oncorhynchus mykiss*	Mount Whitney strain rainbow trout. This hatchery strain of rainbow is not known to spawn in Washington mountain lakes.

OM(PL) = *Oncorhynchus mykiss*	Packwood Lake strain rainbow trout. This wild strain of rainbow from Packwood Lake in Lewis County, Washington, was the primary source of rainbow trout broodstock in Washington from 1917 to 1934.
OM(ST) = *Oncorhynchus mykiss*	Steelhead trout (anadromous rainbow trout).
OM(STAC) = *Oncorhynchus mykiss*	South Tacoma strain of hatchery rainbow trout.
OM(KAM) = *Oncorhynchus mykiss gairdneri*	Kamloops trout are a wild strain of resident interior "redband" rainbow trout from British Columbia, Canada. Most Kamloops rainbow trout planted in Washington mountain lakes are probably derived from a wild broodstock in Pennask Lake, British Columbia.
OM(HG) = *Onchorhynchus mykiss*	Hagerman strain rainbow trout. This hatchery strain of rainbow is obtained from Hagerman, Idaho.
OM(RL) = *Oncorhynchus mykiss irideus*	Ross Lake rainbow trout are a wild strain of resident coastal rainbow trout native to Ross Lake, Washington.
OMA = *Oncorhynchus mykiss aquabonita*	Subspecies of rainbow trout.
SF = *Savelinus fontinalis*	Brook trout are a char native to eastern North America. This fish is often called "Eastern" brook trout in the west, where the name was historically used to distinguish them from rainbow trout (which were originally also “brook trout”).

TABLE E-1: ATTRIBUTES OF 91 LAKES, INCLUDING CURRENT AND PROPOSED MANAGEMENT

Azure

NPS lake code: MP-09-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	North Gorge/Diablo Lakes	Year initially stocked	1938
Secondary Drainage 2	Stetattle Creek	Year last stocked	1961
Elevation	4,055 feet	Current stocking method	—
UTM_E	628433.3125	Outside range of Caudata	Yes
UTM_N	5402997.5000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County (CO)	Whatcom	AMMA present	—
Maximum Depth	344.5 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	8,543.31 feet	AMGR present	—
Lake or pond surface area	91.6 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	8.5°C	Forest	0%
TKN – median	—	Shrub	12%
Fishing potential (based on Trailblazer data)	Fair	Meadow	2%
Shoreline development (ratio between perimeter and surface area)	1.207	Talus	31%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	55%
Inflow type	Ephemeral	Vegetation zone	Alpine
Number of outflow streams	1	Cross-country zone	Elephant Butte
Isolated from any other lake or pond within 2,000 feet	No	Camp name	—
Lake shares drainage with other lakes (other lakes denoted)	Yes (MP-08-01, DD-01-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	7,968 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.1 miles
Species/strains historically present	OM, OMA	Number of overnight visitors to cross-country zone annually	37
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Battalion

NPS lake code: MLY-02-01

Current management: Has reproducing fish and is stocked; located in Lake Chelan NRA and managed by WDFW.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	Company Creek	Year initially stocked	1978
Secondary Drainage 2	Battalion Creek	Year last stocked	1996
Elevation	5,340 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	663973.5000	Outside range of Caudata	—
UTM_N	5356903.7500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	No
Maximum Depth	15.6 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,096.46 feet	AMGR present	No
Lake or pond surface area	6.3 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	12.2°C	Forest	9%
TKN – median	0.035 mg/L	Shrub	39%
Fishing potential (based on Trailblazer data)	Fair	Meadow	20%
Shoreline development (ratio between perimeter and surface area)	1.130	Talus	32%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Perennial	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Battalion
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MLY-01-01)	Camp type	—
Index of connectivity	0.0	Distance to closest lake	826 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OM	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.2 miles
Species/strains historically present	OM,OM(MW)	Number of overnight visitors to cross-country zone annually	0
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	0

Bear

NPS lake code: MC-12-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Bear Creek	Year initially stocked	1967
Secondary Drainage 2	Upper Bear Creek	Year last stocked	1967
Elevation	5,795 feet	Current stocking method	—
UTM_E	623700.4375	Outside range of Caudata	Yes
UTM_N	5422478.5000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	151.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	4,960.63 feet	AMGR present	—
Lake or pond surface area	25.7 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	11.4°C	Forest	0%
TKN – median	0.012 mg/L	Shrub	30%
Fishing potential (based on Trailblazer data)	Good	Meadow	6%
Shoreline development (ratio between perimeter and surface area)	1.324	Talus	63%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	8	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Bear Mountain
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Bear Creek
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-45-01, MC-47-01, Chilliwack Lake)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	9,023 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	Yes
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.7 miles
Species/strains historically present	OCL(TL)	Number of overnight visitors to cross-country zone annually	30
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	3

Berdeen

NPS lake code: M-08-01

Current management: Has reproducing fish and is stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	50
Secondary Drainage 1	Bacon Creek	Year initially stocked	1946
Secondary Drainage 2	Upper Bacon Creek	Year last stocked	1995
Elevation	5,000 feet	Current stocking method	Fixed-wing aircraft*
UTM_E	613080.4250	Outside range of Caudata	Yes
UTM_N	5396745.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	215 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	16,571.52 feet	AMGR present	—
Lake or pond surface area	126.7 acres	Number of times stocked since .....?	7
Median Epilimnetic (surface) water temperature	9.3°C	Forest	0%
TKN – median	—	Shrub	20%
Fishing potential (based on Trailblazer data)	Good	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.990	Talus	54%
Inlet or outlet	Yes	Bedrock	26%
Number of inflow streams	6	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-09-01, M-05-01, M-06-01, M-07-01, M-04-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	223 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	4.3 miles
Species/strains historically present	OCL(TL), OM, OM(MW)	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	5

Note:

* Has not been stocked in the recent past, but contains reproducing populations of fish.

Berdeen, Lower

NPS lake code: M-07-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Bacon Creek	Year initially stocked	1946
Secondary Drainage 2	Upper Bacon Creek	Year last stocked	1946
Elevation	4,460 feet	Current stocking method	—
UTM_E	612074.7188	Outside range of Caudata	—
UTM_N	5395790.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	36.1 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,201.44 feet	AMGR present	No
Lake or pond surface area	7.5 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	2°C	Forest	0%
TKN – median	0.02 mg/L	Shrub	53%
Fishing potential (based on Trailblazer data)	Good	Meadow	21%
Shoreline development (ratio between perimeter and surface area)	1.089	Talus	26%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	Perennial	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-08-01, M-06-01, M-05-01, M-04-01, M-09-01)	Camp type	—
Index of connectivity	0.4	Distance to closest lake	768 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	4.3 miles
Species/strains historically present	OCL(TL), SF, OM	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	5

Berdeen, Upper
NPS lake code: M-09-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Bacon Creek	Year initially stocked	Not applicable
Secondary Drainage 2	Upper Bacon Creek	Year last stocked	Not applicable
Elevation	5,050 feet	Current stocking method	—
UTM_E	—	Outside range of Caudata	Yes
UTM_N	—	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	—	AMGR present	—
Lake or pond surface area	9.5 acres	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	63%
Fishing potential (based on Trailblazer data)	—	Meadow	7%
Shoreline development (ratio between perimeter and surface area)	—	Talus	30%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	—	Camp type	—
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OCL(TL)	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	5

Blum, Largest/Middle, No. 3

NPS lake code: M-11-01

Current management: Has reproducing fish and is stocked; located in the north unit of the national park.

Major Drainage	Baker	Stocking density (fish/acre)	50
Secondary Drainage 1	Baker River	Year initially stocked	1938
Secondary Drainage 2	Blum Creek	Year last stocked	1994
Elevation	5,030 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	610685.1250	Outside range of Caudata	—
UTM_N	5400563.5000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Unknown
Maximum Depth	42 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,218.50 feet	AMGR present	—
Lake or pond surface area	12.9 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	11°C	Forest	0%
TKN – median	—	Shrub	47%
Fishing potential (based on Trailblazer data)	Good	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.211	Talus	53%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Blum
Isolated from any other lake or pond within 2,000 feet	No	Camp name	BLC01
Lake shares drainage with other lakes (other lakes denoted)	Yes (LS-07-01)	Camp type	Cross-country
Index of connectivity	0.3	Distance to closest lake	275 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	OM	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	2.5 miles
Species/strains historically present	SF, OM(MW), OM, OMA	Number of overnight visitors to cross-country zone annually	37
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	4

Blum, Lower/West, No. 4

NPS lake code: LS-07-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Baker	Stocking density (fish/acre)	—
Secondary Drainage 1	Baker River	Year initially stocked	1934
Secondary Drainage 2	Blum Creek	Year last stocked	1934
Elevation	4,940 feet	Current stocking method	—
UTM_E	610273.3750	Outside range of Caudata	—
UTM_N	5400321.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	No
Maximum Depth	25.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,978.35 feet	AMGR present	No
Lake or pond surface area	6.4 acres	Number of times stocked since …..?	1
Median Epilimnetic (surface) water temperature	12.9°C	Forest	0%
TKN – median	0.02 mg/L	Shrub	30%
Fishing potential (based on Trailblazer data)	Good	Meadow	70%
Shoreline development (ratio between perimeter and surface area)	1.059	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	2	Cross-country zone	Blum
Isolated from any other lake or pond within 2,000 feet	No	Camp name	BLC01
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-11-01)	Camp type	Cross-country
Index of connectivity	0.2	Distance to closest lake	275 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	SF	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	SF	Number of overnight visitors cross-country zone annually	37
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	4

Blum, Small/North, No. 2

NPS lake code: MC-01-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Baker	Stocking density (fish/acre)	—
Secondary Drainage 1	Baker River	Year initially stocked	1938
Secondary Drainage 2	Blum Creek	Year last stocked	1938
Elevation	5,620 feet	Current stocking method	—
UTM_E	618360.9063	Outside range of Caudata	—
UTM_N	5391721.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	10 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	544.62 feet	AMGR present	No
Lake or pond surface area	0.9 acre	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	19.5°C	Forest	0%
TKN – median	0.06 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	None	Meadow	44%
Shoreline development (ratio between perimeter and surface area)	1.421	Talus	56%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	4	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Blum
Isolated from any other lake or pond within 2,000 feet	No	Camp name	BLC01
Lake shares drainage with other lakes (other lakes denoted)	No (MC-01-02?, MC-02-01?)	Camp type	Cross-country
Index of connectivity	0.3	Distance to closest lake	7 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	37
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Blum, Vista/Northwest, No. 1

NPS lake code: MC-02-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Baker	Stocking density (fish/acre)	—
Secondary Drainage 1	Baker River	Year initially stocked	1968
Secondary Drainage 2	Blum Creek	Year last stocked	1968
Elevation	5,900 feet	Current stocking method	—
UTM_E	610568.0625	Outside range of Caudata	—
UTM_N	5401157.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	35 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	967.85 feet	AMGR present	No
Lake or pond surface area	2.7 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	11.0°C	Forest	0%
TKN – median	0.04 mg/L	Shrub	37%
Fishing potential (based on Trailblazer data)	None	Meadow	14%
Shoreline development (ratio between perimeter and surface area)	1.382	Talus	49%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Blum
Isolated from any other lake or pond within 2,000 feet	No	Camp name	BLC01
Lake shares drainage with other lakes (other lakes denoted)	No (MC-01-01?, MC-01-02?)	Camp type	Cross-country
Index of connectivity	0.3	Distance to closest lake	372 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	OMA	Number of overnight visitors to cross-country zone annually	37
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Bouck, Lower

NPS lake code: DD-04-01

Current management: Has reproducing fish; located in Ross Lake NRA.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	South Gorge Lake	Year initially stocked	1939
Secondary Drainage 2	Bouck Creek	Year last stocked	1947
Elevation	3,850 feet	Current stocking method	—
UTM_E	633736.0938	Outside range of Caudata	—
UTM_N	5393719.5000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	63.2 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	2,851.05 feet	AMGR present	Unknown
Lake or pond surface area	10.8 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	11.2°C	Forest	60%
TKN – median	0.04 mg/L	Shrub	18%
Fishing potential (based on Trailblazer data)	Good	Meadow	22%
Shoreline development (ratio between perimeter and surface area)	1.172	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Perennial	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Bouck
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (DD-05-01, DD-03-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	1,282 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OCL	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	1.2 miles
Species/strains historically present	OC, OCL	Number of overnight visitors to cross-country zone annually	11
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	1

Bouck, Upper

NPS lake code: DD-05-01

Current management: Stocked; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	60
Secondary Drainage 1	South Gorge Lake	Year initially stocked	1968
Secondary Drainage 2	Bouck Creek	Year last stocked	1999
Elevation	5,030 feet	Current stocking method	Backpack
UTM_E	634995.6250	Outside range of Caudata	—
UTM_N	5393470.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	29 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,132.55 feet	AMGR present	No
Lake or pond surface area	5.5 acres	Number of times stocked since .....?	6
Median Epilimnetic (surface) water temperature	10.5°C	Forest	23%
TKN – median	0.06 mg/L	Shrub	17%
Fishing potential (based on Trailblazer data)	Fair	Meadow	20%
Shoreline development (ratio between perimeter and surface area)	1.232	Talus	41%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Bouck
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (DD-04-01, DD-03-01)	Camp type	—
Index of connectivity	0.2	Distance to closest lake	1,282 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OMA	Line of sight distance to trail	1.9 miles
Species/strains historically present	OMA	Number of overnight visitors to cross-country zone annually	11
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	1

Bowan

NPS lake code: MR-12-01

Current management: Stocked; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	125
Secondary Drainage 1	Rainbow Creek	Year initially stocked	1983
Secondary Drainage 2	Bowan Creek	Year last stocked	2002
Elevation	6,495 feet	Current stocking method	Backpack
UTM_E	669404.4375	Outside range of Caudata	—
UTM_N	5363995.2500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	13.1 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,017.06 feet	AMGR present	No
Lake or pond surface area	1.5 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	0.085 mg/L	Shrub	24%
Fishing potential (based on Trailblazer data)	Fair	Meadow	76%
Shoreline development (ratio between perimeter and surface area)	1.135	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Rainbow Ridge
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Bowan
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-16-01, MR-11-01, MR-15-01, MR-15-02, MR-14-01, . . .)	Camp type	Hiker
Index of connectivity	0.4	Distance to closest lake	5,508 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	2.5 miles
Species/strains historically present	OM(MW)	Number of overnight visitors to cross-country zone annually	6
Stocking frequency (years of cycle)	6	Number of anglers annually (based on 10% assumption of total visitors)	1

Coon

NPS lake code: MM-10-01

Current management: Stocked; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	90
Secondary Drainage 1	Coon Creek	Year initially stocked	1915
Secondary Drainage 2		Year last stocked	2000
Elevation	2,172 feet	Current stocking method	Fixed-wing aircraft; unknown
UTM_E	660536.6563	Outside range of Caudata	—
UTM_N	5361590.2500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	19 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,038.06 feet	AMGR present	No
Lake or pond surface area	11.3 acres	Number of times stocked since .....?	16
Median Epilimnetic (surface) water temperature	16.6°C	Forest	29%
TKN – median	0.147 mg/L	Shrub	13%
Fishing potential (based on Trailblazer data)	Good	Meadow	58%
Shoreline development (ratio between perimeter and surface area)	1.219	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Low forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	High Bridge/Bullion
Lake shares drainage with other lakes (other lakes denoted)	Yes (GM-02-01, MM-06-01, MM-07-01, MM-08-01, MLY-0101, . . .)	Camp type	Auto
Index of connectivity	-0.2	Distance to closest lake	16,637 feet
Observed fish reproduction	—	Accessible by horseback	Yes
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	Yes
Stocked spp/strain present	OCL(TL)	Line of sight distance to trail	0 mile
Species/strains historically present	OCL(TL), SF, OM, OCL	Number of overnight visitors to nearest camp annually	306
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	31

Copper

NPS lake code: MC-06-01

Current management: Stocked; located in the north unit of the national park.
In August 2004, Copper Lake was found fishless, possibly due to disease.

Major Drainage	Chilliwack	Stocking density (fish/acre)	65
Secondary Drainage 1		Year initially stocked	1937
Secondary Drainage 2		Year last stocked	1998
Elevation	5,263 feet	Current stocking method	Fixed-wing aircraft; unknown
UTM_E	610362.1875	Outside range of Caudata	—
UTM_N	5401594.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	67.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,630.58 feet	AMGR present	No
Lake or pond surface area	12.9 acres	Number of times stocked since .....?	9
Median Epilimnetic (surface) water temperature	10.3°C	Forest	0%
TKN – median	0.0315 mg/L	Shrub	37%
Fishing potential (based on Trailblazer data)	Fair	Meadow	5%
Shoreline development (ratio between perimeter and surface area)	1.350	Talus	59%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	0	Cliff	0%
Inflow type	Subsurface	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Copper Lake
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	Hiker
Index of connectivity	-1.4	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	Yes
Stocked spp/strain present	OM(MW), OCC	Line of sight distance to trail	1.9 miles
Species/strains historically present	SF, OC, OCC, OCL(TL), OM(MW)	Number of overnight visitors to nearest camp annually	268
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	27

Dagger

NPS lake code: MR-04-01

Current management: Has reproducing fish; located in the south unit of the national park.

Major Drainage	Stehekin	Stocking density (fish/acre)	—
Secondary Drainage 1	Bridge Creek	Year initially stocked	1934
Secondary Drainage 2	East Fork Bridge Creek	Year last stocked	1934
Elevation	5,508 feet	Current stocking method	—
UTM_E	673404.1250	Outside range of Caudata	—
UTM_N	5370807.2500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	No
Maximum Depth	15.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,188.98 feet	AMGR present	No
Lake or pond surface area	8.2 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	12.3°C	Forest	3%
TKN – median	0.015 mg/L	Shrub	36%
Fishing potential (based on Trailblazer data)	Good	Meadow	60%
Shoreline development (ratio between perimeter and surface area)	1.508	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	CP	Vegetation zone	High forest
Number of outflow streams	—	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Dagger Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-01-01, MR-02-01, MR-03-01)	Camp type	Hiker/stock
Index of connectivity	0.5	Distance to closest lake	1,455 feet
Observed fish reproduction	Yes	Accessible by horseback	Yes
Observed spawning habitat present	Yes	Trailhead outside the park	Yes
Reproducing species present	OC	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OC	Number of overnight visitors to nearest camp annually	164
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	16

Dee Dee, Upper

NPS lake code: MR-15-01

Current management: Stocked; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	Rainbow Creek	Year initially stocked	1983
Secondary Drainage 2		Year last stocked	1999
Elevation	6,303 feet	Current stocking method	Backpack
UTM_E	674007.5313	Outside range of Caudata	—
UTM_N	5363620.7500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	No
Maximum Depth	89.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,825.46 feet	AMGR present	No
Lake or pond surface area	12.2 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	7.4°C	Forest	0%
TKN – median	0.015 mg/L	Shrub	14%
Fishing potential (based on Trailblazer data)	Good	Meadow	6%
Shoreline development (ratio between perimeter and surface area)	1.482	Talus	80%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	Subsurface	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Dee Dee Lakes
Isolated from any other lake or pond within 2,000 feet	No	Camp name	DDC05, DDC01, DDC01S
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-15-02, MR-18-01, MR-11-01, MR-12-01, MR-16-01)	Camp type	Cross-country
Index of connectivity	0.2	Distance to closest lake	88 feet
Observed fish reproduction	—	Accessible by horseback	Yes
Observed spawning habitat present	Yes	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	Yes
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM, OM(MW)	Number of overnight visitors to cross-country zone annually	38
Stocking frequency (years of cycle)	10	Number of anglers annually (based on 10% assumption of total visitors)	4

Dee Dee/Tamarack, Lower

NPS lake code: MR-15-02

Current management: Has reproducing fish and a portion of the fish stocked in MR-15-01 drop down into MR-15-02; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	Rainbow Creek	Year initially stocked	Unknown
Secondary Drainage 2		Year last stocked	Unknown
Elevation	6,260 feet	Current stocking method	—
UTM_E	674044.8750	Outside range of Caudata	—
UTM_N	5363845.0000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	No
Maximum Depth	9.8 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	718.50 feet	AMGR present	No
Lake or pond surface area	0.8 acre	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	7.1°C	Forest	16%
TKN – median	0.005 mg/L	Shrub	29%
Fishing potential (based on Trailblazer data)	Fair	Meadow	39%
Shoreline development (ratio between perimeter and surface area)	1.105	Talus	16%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	Perennial	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Dee Dee Lakes
Isolated from any other lake or pond within 2,000 feet	No	Camp name	DDC02, DDC03, DDC04, DDC06
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-15-01, MR-18-01, MR-11-01, MR-12-01, MR-16-01)	Camp type	Cross-country
Index of connectivity	0.2	Distance to closest lake	88 feet
Observed fish reproduction	No ** No reproduction according to the Technical Advisory Committee	Accessible by horseback	Yes
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	Yes
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	—
Species/strains historically present	OM(MW), OCL(TL)	Number of overnight visitors to cross-country zone annually	38
Stocking frequency (years of cycle)	10	Number of anglers annually (based on 10% assumption of total visitors)	4

Despair, Lower

NPS lake code: M-14-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Goodell Creek	Year initially stocked	1965
Secondary Drainage 2	Lower Goodell Creek	Year last stocked	1965
Elevation	4,820 feet	Current stocking method	—
UTM_E	620043.5000	Outside range of Caudata	Yes
UTM_N	5398225.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	1,089.24 feet	AMGR present	—
Lake or pond surface area	1.7 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	43%
Fishing potential (based on Trailblazer data)	None	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.121	Talus	57%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Despair
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	—
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.7 miles
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	49
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Despair, Upper

NPS lake code: M-13-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Goodell Creek	Year initially stocked	1965
Secondary Drainage 2	Lower Goodell Creek	Year last stocked	1965
Elevation	5,100 feet	Current stocking method	—
UTM_E	619681.0938	Outside range of Caudata	Yes
UTM_N	5398278.2500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	1,591.21 feet	AMGR present	—
Lake or pond surface area	2.1 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	None	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.483	Talus	100%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Alpine
Number of outflow streams	—	Cross-country zone	Despair
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-21-01, M-16-01, MC-27-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	1,129 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Repro species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.7 miles
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	49
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Diobsud, No. 1, separate, not connected

NPS lake code: LS-01-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Diobsud Creek	Year initially stocked	1960
Secondary Drainage 2	Upper Diobsud Creek	Year last stocked	1990
Elevation	4,220 feet	Current stocking method	—
UTM_E	607860.4688	Outside range of Caudata	—
UTM_N	5388784.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	11.2 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	846.46 feet	AMGR present	Yes
Lake or pond surface area	1 acre	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	14.1°C	Forest	0%
TKN – median	0.08 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Fair	Meadow	76%
Shoreline development (ratio between perimeter and surface area)	1.143	Talus	24%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	0	Cliff	0%
Inflow type	—	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Bacon Peak
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (LS-02-01, LS-03-01, LS-03-FS, LS-12-01)	Camp type	—
Index of connectivity	0.4	Distance to closest lake	1,300 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.1 miles
Species/strains historically present	OCL(TL)	Number of overnight visitors to cross-country zone annually	34
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	3

Diobsud, No. 2, Lower

NPS lake code: LS-02-01

Current management: Has reproducing fish and is stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	70
Secondary Drainage 1	Diobsud Creek	Year initially stocked	1960
Secondary Drainage 2	Upper Diobsud Creek	Year last stocked	1990
Elevation	4,220 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	607813.8125	Outside range of Caudata	—
UTM_N	5388931.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	17.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,404.20 feet	AMGR present	No
Lake or pond surface area	3.1 acres	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	13.7°C	Forest	0%
TKN – median	0.06 mg/L	Shrub	47%
Fishing potential (based on Trailblazer data)	Good	Meadow	53%
Shoreline development (ratio between perimeter and surface area)	1.076	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Bacon Peak
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (LS-01-01, LS-03-01, LS-03-FS, LS-12-01)	Camp type	—
Index of connectivity	0.5	Distance to closest lake	420 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	3.1 miles
Species/strains historically present	OCL(TL), OM(MW)	Number of overnight visitors to cross-country zone annually	34
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	3

Diobsud, No. 3, Upper

NPS lake code: LS-03-01

Current management: Stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	80
Secondary Drainage 1	Diobsud Creek	Year initially stocked	1960
Secondary Drainage 2	Upper Diobsud Creek	Year last stocked	1997
Elevation	4,420 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	607400.7813	Outside range of Caudata	—
UTM_N	5389244.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	17.1 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,538.71 feet	AMGR present	No
Lake or pond surface area	3.9 acres	Number of times stocked since .....?	7
Median Epilimnetic (surface) water temperature	14.8°C	Forest	0%
TKN – median	0.0545 mg/L	Shrub	24%
Fishing potential (based on Trailblazer data)	Good	Meadow	76%
Shoreline development (ratio between perimeter and surface area)	1.056	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Bacon Peak
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (LS-02-01, LS-01-01, LS-03-FS, LS-12-01)	Camp type	—
Index of connectivity	0.5	Distance to closest lake	420 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	0 mile
Species/strains historically present	OCL(TL), OM(MW)	Number of overnight visitors to cross-country zone annually	34
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	3

Doubtful

NPS lake code: CP-01-01

Current management: Has reproducing fish; located in the south unit of the national park.

Major Drainage	Stehekin	Stocking density (fish/acre)	—
Secondary Drainage 1	Upper Stehekin	Year initially stocked	1950
Secondary Drainage 2	Stehekin Headwaters	Year last stocked	1962
Elevation	5,385 feet	Current stocking method	—
UTM_E	644384.0625	Outside range of Caudata	Yes
UTM_N	5370621.0000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	—
County	Chelan	AMMA present	No
Maximum Depth	68.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	4,770.34 feet	AMGR present	No
Lake or pond surface area	30.2 acres	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	10.9°C	Forest	0%
TKN – median	0.0185 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Fair	Meadow	55%
Shoreline development (ratio between perimeter and surface area)	1.174	Talus	34%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	7	Cliff	11%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Pelton Basin Camp
Lake shares drainage with other lakes (other lakes denoted)	Yes (CP-02-01, GM-01-01)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	2,323 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	OC, OM, OMxOC	Trail to lake	Yes
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OC, OM	Number of overnight visitors to nearest camp annually	441
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	44

Doug's Tarn

NPS lake code: M-21-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Goodell Creek	Year initially stocked	1965
Secondary Drainage 2	Lower Goodell Creek	Year last stocked	1965
Elevation	3,951 feet	Current stocking method	—
UTM_E	620338.5000	Outside range of Caudata	Yes
UTM_N	5397650.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	10.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,948.82 feet	AMGR present	No
Lake or pond surface area	5 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	11.2°C	Forest	10%
TKN – median	0.01 mg/L	Shrub	53%
Fishing potential (based on Trailblazer data)	Good	Meadow	29%
Shoreline development (ratio between perimeter and surface area)	1.177	Talus	7%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	8	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Despair
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-13-01, M-16-01, MC-27-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	1,129 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OC	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.1 miles
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	49
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	5

East Lake, Lower

NPS lake code: MC-14-02

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	—
Secondary Drainage 1	Northwest Ross Lake	Year initially stocked	1967
Secondary Drainage 2	Upper Little Beaver Creek	Year last stocked	1967
Elevation	5,460 feet	Current stocking method	—
UTM_E	622451.6563	Outside range of Caudata	Yes
UTM_N	5416393.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	2,378.61 feet	AMGR present	No
Lake or pond surface area	8 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	15.6°C	Forest	0%
TKN – median	—	Shrub	57%
Fishing potential (based on Trailblazer data)	Poor	Meadow	25%
Shoreline development (ratio between perimeter and surface area)	1.134	Talus	18%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	8	Cliff	0%
Inflow type	PE	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Bear Mountain
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-14-01, MC-22-01, MC-16-02, MC-15-01, . . .)	Camp type	—
Index of connectivity	—	Distance to closest lake	340 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	30
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

East Lake, Upper

NPS lake code: MC-14-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	—
Secondary Drainage 1	Northwest Ross Lake	Year initially stocked	1967
Secondary Drainage 2	Upper Little Beaver Creek	Year last stocked	1967
Elevation	5,595 feet	Current stocking method	—
UTM_E	621986.9688	Outside range of Caudata	Yes
UTM_N	5416670.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	2,063.65 feet	AMGR present	—
Lake or pond surface area	6.2 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Fair	Meadow	12%
Shoreline development (ratio between perimeter and surface area)	1.119	Talus	88%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Bear Mountain
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-14-02, MC-22-01, MC-16-02, MC-15-01, . . .)	Camp type	—
Index of connectivity	—	Distance to closest lake	340 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	1.2 miles
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	34
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Firn

NPS lake code: MP-02-01

Current management: Has limited population of reproducing fish and is stocked; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	50
Secondary Drainage 1	Big Beaver Creek	Year initially stocked	1968
Secondary Drainage 2	Thirtynine Mile Creek	Year last stocked	2000
Elevation	5,472 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	635626.3135	Outside range of Caudata	Yes
UTM_N	5410361.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	37.7 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,599.08 feet	AMGR present	No
Lake or pond surface area	5.7 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	12.6°C	Forest	0%
TKN – median	—	Shrub	8%
Fishing potential (based on Trailblazer data)	Good	Meadow	7%
Shoreline development (ratio between perimeter and surface area)	2.045	Talus	85%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Prophet
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	39-Mile
Lake shares drainage with other lakes (other lakes denoted)	Yes (MP-05-01, MP-06-06, MP-06-01, MP-06-02, MP-06-03, . . .)	Camp type	Hiker/stock
Index of connectivity	—	Distance to closest lake	4,985 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.9 miles
Species/strains historically present	OCL(TL), OM(MW), OM	Number of overnight visitors to cross-country zone annually	3
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	0

Green

NPS lake code: M-04-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Bacon Creek	Year initially stocked	1946
Secondary Drainage 2	Upper Bacon Creek	Year last stocked	1947
Elevation	4,261 feet	Current stocking method	—
UTM_E	610200.6563	Outside range of Caudata	—
UTM_N	5394060.2500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Unknown
Maximum Depth	153.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	9,202.76 feet	AMGR present	No
Lake or pond surface area	80 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	8.7°C	Forest	0%
TKN – median	—	Shrub	71%
Fishing potential (based on Trailblazer data)	Good	Meadow	10%
Shoreline development (ratio between perimeter and surface area)	1.391	Talus	19%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	5	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	2	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MP-05-01, MP-06-01, MP-07-01, MP-08-01, MP-09-01)	Camp type	—
Index of connectivity	0.4	Distance to closest lake	4,258 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	OCL(TL), OM, OCLxOM	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	4.3 miles
Species/strains historically present	OCL(TL), OM	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	5

Green Bench Lake

NPS lake code: LS-04-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Bacon Creek	Year initially stocked	Unknown
Secondary Drainage 2	Bacon Creek	Year last stocked	Unknown
Elevation	4,870 feet	Current stocking method	—
UTM_E	609985.0625	Outside range of Caudata	Yes
UTM_N	5393136.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	21.5 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,250.66 feet	AMGR present	—
Lake or pond surface area	3.9 acres	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	10.5°C	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Fair	Meadow	9%
Shoreline development (ratio between perimeter and surface area)	1.537	Talus	13%
Inlet or outlet	No	Bedrock	78%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Alpine
Number of outflow streams	—	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	—
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	4.3 miles
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Hanging

NPS lake code: MC-08-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	Unknown
Secondary Drainage 2		Year last stocked	Unknown
Elevation	4,522 feet	Current stocking method	—
UTM_E	613307.3438	Outside range of Caudata	—
UTM_N	5428243.7500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Unknown
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	8,077.43 feet	AMGR present	—
Lake or pond surface area	88.8 acres	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	—	Forest	20%
TKN – median	—	Shrub	14%
Fishing potential (based on Trailblazer data)	Good	Meadow	8%
Shoreline development (ratio between perimeter and surface area)	1.159	Talus	58%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	High forest
Number of outflow streams	—	Cross-country zone	Little Chilliwack
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Little Chilliwack
Lake shares drainage with other lakes (other lakes denoted)	Yes (Chilliwack Lake, MC-07-01)	Camp type	Hiker
Index of connectivity	NA	Distance to closest lake	4,356 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	Yes
Reproducing species present	OM	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	1.9 miles
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	5
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	1

Hidden

NPS lake code: SB-01-01

Current management: Has limited population of reproducing fish and is also stocked; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	20, 40
Secondary Drainage 1	Cascade River	Year initially stocked	1946
Secondary Drainage 2	North Fork Cascade River	Year last stocked	2001
Elevation	5,733 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	633941.4063	Outside range of Caudata	Yes
UTM_N	5372785.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	258.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	7,844.49 feet	AMGR present	—
Lake or pond surface area	61.7 acres	Number of times stocked since .....?	11
Median Epilimnetic (surface) water temperature	7.2°C	Forest	0%
TKN – median	—	Shrub	30%
Fishing potential (based on Trailblazer data)	Good	Meadow	2%
Shoreline development (ratio between perimeter and surface area)	1.350	Talus	69%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	5	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Hidden Lake
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (SB-03-01, SB-03-02, EP-14-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	56 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OM, OMA	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	0.6 mile
Species/strains historically present	OMA, OM(KAM), OM, OM(MW)	Number of overnight visitors to cross-country zone annually	112
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	11

Hidden Lake Tarn

NPS lake code: EP-14-01

Current management: Stocked; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	40
Secondary Drainage 1	Cascade River	Year initially stocked	1966
Secondary Drainage 2	North Fork Cascade River	Year last stocked	2002
Elevation	5,830 feet	Current stocking method	Backpack
UTM_E	634043.8125	Outside range of Caudata	Yes
UTM_N	5373554.2500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	—
Maximum Depth	42.7 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,050.53 feet	AMGR present	—
Lake or pond surface area	4.9 acres	Number of times stocked since .....?	5
Median Epilimnetic (surface) water temperature	12.8°C	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Good	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.248	Talus	100%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Alpine
Number of outflow streams	1	Cross-country zone	Hidden Lake
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (SB-01-01, SB-03-02, SB-03-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	5,180 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.2 miles
Species/strains historically present	OM, OM(HG), OM(MW)	Number of overnight visitors to cross-country zone annually	112
Stocking frequency (years of cycle)	6	Number of anglers annually (based on 10% assumption of total visitors)	11

Hi-Yu

NPS lake code: M-01-01

Current management: Stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	100
Secondary Drainage 1	Bacon Creek	Year initially stocked	1961
Secondary Drainage 2	Upper Bacon Creek	Year last stocked	2001
Elevation	3,830 feet	Current stocking method	Backpack; unknown
UTM_E	613062.5625	Outside range of Caudata	—
UTM_N	5390848.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	18 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,646.98 feet	AMGR present	No
Lake or pond surface area	3.6 acres	Number of times stocked since .....?	6
Median Epilimnetic (surface) water temperature	16.4°C	Forest	0%
TKN – median	0.06 mg/L	Shrub	44%
Fishing potential (based on Trailblazer data)	Good	Meadow	56%
Shoreline development (ratio between perimeter and surface area)	1.168	Talus	0%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	0	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Bacon Peak
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	—
Index of connectivity	0.2	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	2.5 miles
Species/strains historically present	OM, OM(MW)	Number of overnight visitors to cross-country zone annually	34
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	3

Hozomeen

NPS lake code: HM-02-01

Current management: Has reproducing fish; located in Ross Lake NRA.

Major Drainage	Ross	Stocking density (fish/acre)	—
Secondary Drainage 1	Northeast Ross Lake	Year initially stocked	Unknown
Secondary Drainage 2	Hozomeen Creek	Year last stocked	Unknown
Elevation	2,823 feet	Current stocking method	—
UTM_E	643801.4375	Outside range of Caudata	—
UTM_N	5424707.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	66.7 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	10,823.49 feet	AMGR present	Yes
Lake or pond surface area	97.4 acres	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	17.4°C	Forest	95%
TKN – median	0.101 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Good	Meadow	3%
Shoreline development (ratio between perimeter and surface area)	1.482	Talus	2%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	Perennial	Vegetation zone	Low forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Hozomeen Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (HM-03-01, Ross Lake)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	4,961 feet
Observed fish reproduction	Yes	Accessible by horseback	Yes
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	SF	Trail to lake	Yes
Stocked spp/strain present	—	Line of sight distance to trail	0 mile
Species/strains historically present	SF	Number of overnight visitors to nearest camp annually	280
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	28

Ipsoot

NPS lake code: LS-06-01

Current management: Has reproducing fish; located in the north unit of the national park.

Major Drainage	Baker	Stocking density (fish/acre)	—
Secondary Drainage 1	Baker River	Year initially stocked	1936
Secondary Drainage 2	Hidden Creek	Year last stocked	1961
Elevation	4,460 feet	Current stocking method	—
UTM_E	607515.5625	Outside range of Caudata	—
UTM_N	5396239.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	50.8 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,401.57 feet	AMGR present	No
Lake or pond surface area	8.9 acres	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	19.7°C	Forest	0%
TKN – median	—	Shrub	73%
Fishing potential (based on Trailblazer data)	Good	Meadow	27%
Shoreline development (ratio between perimeter and surface area)	1.087	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	7	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (LS-01-01, LS-02-01, LS-03-01, LS-12-01)	Camp type	—
Index of connectivity	0.3	Distance to closest lake	7,652 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OCB	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	OCL(TL), OM	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	5

Jeanita

NPS lake code: DD-01-01

Current management: Has limited population of reproducing fish and is stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	75
Secondary Drainage 1	North Gorge/Diablo Lakes	Year initially stocked	1961
Secondary Drainage 2	Stetattle Creek	Year last stocked	1986
Elevation	4,904 feet	Current stocking method	Backpack; unknown
UTM_E	636844.2188	Outside range of Caudata	—
UTM_N	5400636.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	8 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,161.42 feet	AMGR present	No
Lake or pond surface area	1.4 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	12.7°C	Forest	0%
TKN – median	0.06 mg/L	Shrub	25%
Fishing potential (based on Trailblazer data)	Fair	Meadow	62%
Shoreline development (ratio between perimeter and surface area)	1.331	Talus	13%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	5	Cliff	0%
Inflow type	Mixed	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Sourdough
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Sourdough
Lake shares drainage with other lakes (other lakes denoted)	Yes (DD-03-01, MP-08-01, MP-09-01)	Camp type	Hiker
Index of connectivity	-0.5	Distance to closest lake	4,592 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	OMA	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OMA	Number of overnight visitors to cross-country zone and nearest camp annually	92
Stocking frequency (years of cycle)	7	Number of anglers annually (based on 10% assumption of total visitors)	9

Kettling

NPS lake code: MR-05-01

Current management: Has reproducing fish; located in the south unit of the national park.

Major Drainage	Stehekin	Stocking density (fish/acre)	—
Secondary Drainage 1	Bridge Creek	Year initially stocked	Unknown
Secondary Drainage 2	Kettling Creek	Year last stocked	Unknown
Elevation	5,375 feet	Current stocking method	—
UTM_E	667808.8750	Outside range of Caudata	—
UTM_N	5368447.500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	23 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,627.95 feet	AMGR present	No
Lake or pond surface area	9.9 acres	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	11.4°C	Forest	60%
TKN – median	0.055 mg/L	Shrub	35%
Fishing potential (based on Trailblazer data)	Good	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.129	Talus	5%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	Mixed	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Kettling
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-06-01, MR-09-01, MR-01-01, MR-04-01)	Camp type	—
Index of connectivity	0.5	Distance to closest lake	417 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	Yes
Reproducing species present	OC, OM, OMxOC	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	1.2 miles
Species/strains historically present	IC, OM, OMxOC	Number of overnight visitors to cross-country zone annually	7
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	1

Kwahnesum

NPS lake code: MC-07-01

Current management: Stocked; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	100
Secondary Drainage 1	Chilliwack River	Year initially stocked	1983
Secondary Drainage 2	Little Chilliwack River	Year last stocked	1998
Elevation	5,102 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	613584.6563	Outside range of Caudata	—
UTM_N	5419305.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	104.3 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,559.71 feet	AMGR present	No
Lake or pond surface area	16.4 acres	Number of times stocked since .....?	5
Median Epilimnetic (surface) water temperature	12.3°C	Forest	18%
TKN – median	0.05 mg/L	Shrub	13%
Fishing potential (based on Trailblazer data)	Fair	Meadow	23%
Shoreline development (ratio between perimeter and surface area)	1.076	Talus	46%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	4	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Little Chilliwack
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Little Chilliwack
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-08-01)	Camp type	Hiker
Index of connectivity	-0.9	Distance to closest lake	11,104 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	0 mile
Species/strains historically present	OM(MW)	Number of overnight visitors to cross-country zone annually	5
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	1

McAlester

NPS lake code: MR-10-01

Current management: Has reproducing fish; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	—
Secondary Drainage 1	Bridge Creek	Year initially stocked	1941
Secondary Drainage 2	McAlester Creek	Year last stocked	1976
Elevation	5,507 feet	Current stocking method	—
UTM_E	672011.0938	Outside range of Caudata	—
UTM_N	5366347.5000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	23 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,034.78 feet	AMGR present	No
Lake or pond surface area	13.2 acres	Number of times stocked since .....?	5
Median Epilimnetic (surface) water temperature	13°C	Forest	57%
TKN – median	0.045 mg/L	Shrub	9%
Fishing potential (based on Trailblazer data)	Good	Meadow	29%
Shoreline development (ratio between perimeter and surface area)	1.127	Talus	5%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	CP	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	McAlester Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-23-02, MR-09-01, MR-25-01)	Camp type	Hiker/stock
Index of connectivity	0.7	Distance to closest lake	3,483 feet
Observed fish reproduction	Yes	Accessible by horseback	Yes
Observed spawning habitat present	Yes	Trailhead outside the park	Yes
Reproducing species present	OCL(TL)	Trail to lake	Yes
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OC, OM, OCL(TL)	Number of overnight visitors to nearest camp annually	372
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	37

Middle, Lower

NPS lake code: MC-16-02

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	—
Secondary Drainage 1	Northwest Ross Lake	Year initially stocked	1967
Secondary Drainage 2	Upper Little Beaver Creek	Year last stocked	1967
Elevation	5,595 feet	Current stocking method	—
UTM_E	620974.6250	Outside range of Caudata	Yes
UTM_N	5415831.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	8 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,414.04 feet	AMGR present	No
Lake or pond surface area	2.9 acres	Number of times stocked since …..?	1
Median Epilimnetic (surface) water temperature	3.4°C	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Poor	Meadow	69%
Shoreline development (ratio between perimeter and surface area)	1.121	Talus	31%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	CP	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Middle Lakes
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Twin Rocks
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-16-01?, MC-14-01, MC-14-02, MC-22-01, . .)	Camp type	Hiker/stock
Index of connectivity	—	Distance to closest lake	696 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	13
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Middle, Upper

NPS lake code: MC-16-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	—
Secondary Drainage 1	Northwest Ross Lake	Year initially stocked	1967
Secondary Drainage 2	Upper Little Beaver Creek	Year last stocked	1967
Elevation	5,700 feet	Current stocking method	—
UTM_E	620725.6875	Outside range of Caudata	Yes
UTM_N	5416001.7500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	25.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,856.96 feet	AMGR present	—
Lake or pond surface area	4.5 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	7.9°C	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Poor	Meadow	14%
Shoreline development (ratio between perimeter and surface area)	1.184	Talus	86%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Middle Lakes
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Twin Rocks
Lake shares drainage with other lakes (other lakes denoted)	No (MC-16-02?)	Camp type	Hiker/stock
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	13
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Monogram

NPS lake code: M-23-01

Current management: Stocked with nonreproducing fish. Reproduction is not expected to occur in the lake; however, reproduction status should be confirmed; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	70
Secondary Drainage 1	Cascade River	Year initially stocked	1932
Secondary Drainage 2	Monogram Creek	Year last stocked	1995
Elevation	4,873 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	613869.7813	Outside range of Caudata	—
UTM_N	5397481.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	122 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,066.27 feet	AMGR present	No
Lake or pond surface area	29.1 acres	Number of times stocked since .....?	10
Median Epilimnetic (surface) water temperature	12.3°C	Forest	0%
TKN – median	0.023 mg/L	Shrub	66%
Fishing potential (based on Trailblazer data)	Good	Meadow	34%
Shoreline development (ratio between perimeter and surface area)	1.214	Talus	0%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Monogram Lake
Lake shares drainage with other lakes (other lakes denoted)	No (M-23-11?)	Camp type	Hiker
Index of connectivity	0.9	Distance to closest lake	65 feet
Observed fish reproduction	Yes. Reproduction has been observed in the past, but currently no reproduction is expected to occur in this lake.	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	Yes
Reproducing species present	OCL(TL)	Trail to lake	Yes
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	—
Species/strains historically present	OMB, OC, OCL(TL), OM, OM(MW)	Number of overnight visitors to nearest camp annually	94
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	9

Monogram Tarn

NPS lake code: M-23-11

Current management: Undoc. Stocking; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Cascade River	Year initially stocked	Unknown
Secondary Drainage 2	Monogram Creek	Year last stocked	Unknown
Elevation	4,860 feet	Current stocking method	—
UTM_E	626686.8750	Outside range of Caudata	—
UTM_N	5379316.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Skagit	AMMA present	No
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	—	AMGR present	No
Lake or pond surface area	—	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	—	Forest	—
TKN – median	—	Shrub	—
Fishing potential (based on Trailblazer data)	None	Meadow	—
Shoreline development (ratio between perimeter and surface area)	—	Talus	—
Inlet or outlet	No	Bedrock	—
Number of inflow streams	—	Cliff	—
Inflow type	CP	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Monogram Lake
Lake shares drainage with other lakes (other lakes denoted)	No (M-23-01?)	Camp type	Hiker
Index of connectivity	0.8	Distance to closest lake	65 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	Yes
Stocked spp/strain present	OCL(TL)	Line of sight distance to trail	—
Species/strains historically present	OCL(TL)	Number of overnight visitors to nearest camp annually	94
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	9

Nert

NPS lake code: M-05-01

Current management: Stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	50
Secondary Drainage 1	Bacon Creek	Year initially stocked	1968
Secondary Drainage 2	Upper Bacon Creek	Year last stocked	1993
Elevation	4,556 feet	Current stocking method	Backpack; unknown
UTM_E	610336.1875	Outside range of Caudata	—
UTM_N	5395532.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	29.5 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,811.02 feet	AMGR present	No
Lake or pond surface area	3.6 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	15.8°C	Forest	0%
TKN – median	0.084 mg/L	Shrub	35%
Fishing potential (based on Trailblazer data)	None	Meadow	53%
Shoreline development (ratio between perimeter and surface area)	1.296	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	12%
Inflow type	Ephemeral	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-07-01, M-06-01, M-04-01, M-08-01, M-09-01)	Camp type	—
Index of connectivity	0.2	Distance to closest lake	2,674 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	3.7 miles
Species/strains historically present	OMA, OM(MW)	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	5

Noisy Creek, **Upper**

NPS lake code: LS-14-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Baker	Stocking density (fish/acre)	—
Secondary Drainage 1	Noisy Creek	Year initially stocked	1960
Secondary Drainage 2	Noisy Creek	Year last stocked	1960
Elevation	3,660 feet	Current stocking method	—
UTM_E	606791.6875	Outside range of Caudata	—
UTM_N	5391069.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	Yes
Perimeter	518.37 feet	AMGR present	Unknown
Lake or pond surface area	0.3 acre	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	39%
Fishing potential (based on Trailblazer data)	None	Meadow	61%
Shoreline development (ratio between perimeter and surface area)	1.335	Talus	0%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	High forest
Number of outflow streams	—	Cross-country zone	Bacon Peak
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	—
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	34
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

No Name

NPS lake code: PM-01-01

Current management: Stocked; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	70
Secondary Drainage 1	West Ross Lake	Year initially stocked	1947
Secondary Drainage 2	No Name Creek	Year last stocked	1993
Elevation	3,843 feet	Current stocking method	Backpack; unknown
UTM_E	638530.6875	Outside range of Caudata	Yes
UTM_N	5412328.000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	31.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,339.24 feet	AMGR present	—
Lake or pond surface area	7.5 acres	Number of times stocked since .....?	5
Median Epilimnetic (surface) water temperature	7.6°C	Forest	5%
TKN – median	0.021 mg/L	Shrub	58%
Fishing potential (based on Trailblazer data)	Good	Meadow	37%
Shoreline development (ratio between perimeter and surface area)	1.156	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	4	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Prophet
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (Ross Lake)	Camp type	—
Index of connectivity	—	Distance to closest lake	6,663 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	3.7 miles
Species/strains historically present	OM(MW), OM	Number of overnight visitors to cross-country zone annually	3
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	0

Panther Potholes, Lower

NPS lake code: RD-05-02

Current management: Stocked; located in Ross Lake NRA.

Major Drainage	Skagit	Stocking density (fish/acre)	100
Secondary Drainage 1	Thunder Creek	Year initially stocked	1935
Secondary Drainage 2	Lower Thunder Creek	Year last stocked	1994
Elevation	3,375 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	644431.5313	Outside range of Caudata	—
UTM_N	5391174.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	17.2 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	662.73 feet	AMGR present	Yes
Lake or pond surface area	0.5 acres	Number of times stocked since .....?	9
Median Epilimnetic (surface) water temperature	17.4°C	Forest	52%
TKN – median	0.06 mg/L	Shrub	21%
Fishing potential (based on Trailblazer data)	Fair	Meadow	18%
Shoreline development (ratio between perimeter and surface area)	1.225	Talus	8%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	CP	Vegetation zone	Low forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Fourth of July
Lake shares drainage with other lakes (other lakes denoted)	Yes (RD-05-01)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	6 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OCC	Line of sight distance to trail	0 mile
Species/strains historically present	OCB(HL), OCL(TL), OCC, CT	Number of overnight visitors to nearest camp annually	342
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	34

Panther Potholes, Upper

NPS lake code: RD-05-01

Current management: Fishless; located in Ross Lake NRA.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Thunder Creek	Year initially stocked	1979
Secondary Drainage 2	Lower Thunder Creek	Year last stocked	1988
Elevation	3,380 feet	Current stocking method	—
UTM_E	644490.5938	Outside range of Caudata	—
UTM_N	5391197.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	9.4 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	383.86 feet	AMGR present	Yes
Lake or pond surface area	0.2 acre	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	17.8°C	Forest	0%
TKN – median	0.125 mg/L	Shrub	37%
Fishing potential (based on Trailblazer data)	Poor	Meadow	34%
Shoreline development (ratio between perimeter and surface area)	1.161	Talus	30%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	0	Cliff	0%
Inflow type	—	Vegetation zone	Low forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Fourth of July
Lake shares drainage with other lakes (other lakes denoted)	Yes (RD-05-02)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	6 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0 mile
Species/strains historically present	OCB(HL), OCL(TL)	Number of overnight visitors to nearest camp annually	342
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Pegasus

NPS lake code: EP-10-01

Current management: Fishless; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Thunder Creek	Year initially stocked	1967
Secondary Drainage 2	McAllister Creek	Year last stocked	1981
Elevation	5,620 feet	Current stocking method	—
UTM_E	637882.5938	Outside range of Caudata	Yes
UTM_N	5383096.7500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	2,851.05 feet	AMGR present	—
Lake or pond surface area	10.9 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	37%
Fishing potential (based on Trailblazer data)	Poor	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.167	Talus	63%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Alpine
Number of outflow streams	—	Cross-country zone	Klawatti
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (FP-01-01, EP-02-01, EP-11-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	399 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OC, OM, OM(MW)	Number of overnight visitors to cross-country zone annually	193
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Pond Southeast of Kettling Lakes

NPS lake code: MR-09-01

Current management: Stocked; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	Bridge Creek	Year initially stocked	1988
Secondary Drainage 2	Kettling Creek	Year last stocked	1998
Elevation	5,945 feet	Current stocking method	Backpack
UTM_E	668974.3125	Outside range of Caudata	—
UTM_N	5366745.5000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	16.1 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,722.44 feet	AMGR present	No
Lake or pond surface area	4.7 acres	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	0.014 mg/L	Shrub	63%
Fishing potential (based on Trailblazer data)	Good	Meadow	7%
Shoreline development (ratio between perimeter and surface area)	1.077	Talus	30%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Kettling
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-10-01, MR-25-01, MR-23-02)	Camp type	—
Index of connectivity	0.7	Distance to closest lake	5,563 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.2 miles
Species/strains historically present	OC, OM(MW)	Number of overnight visitors to cross-country zone annually	7
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	1

Quill, Lower

NPS lake code: M-24-02

Current management: Stocked with nonreproducing fish. Limited reproduction has been observed in the past and needs to be verified. Located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	25
Secondary Drainage 1	Damnation Creek	Year initially stocked	1961
Secondary Drainage 2	Damnation Creek	Year last stocked	2002
Elevation	4,510 feet	Current stocking method	Backpack
UTM_E	618451.7813	Outside range of Caudata	—
UTM_N	5391771.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Unknown
Maximum Depth	18 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	731.63 feet	AMGR present	—
Lake or pond surface area	1 acre	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	38%
Fishing potential (based on Trailblazer data)	Good	Meadow	30%
Shoreline development (ratio between perimeter and surface area)	1.045	Talus	33%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Despair
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No (M-24-01?)	Camp type	—
Index of connectivity	0.0	Distance to closest lake	48 feet
Observed fish reproduction	Yes. Stocked with nonreproducing fish. Limited reproduction has been observed in the past and needs to be verified.	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OM* reproducing status needs to be verified	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	2.5 miles
Species/strains historically present	OM, OM(MW)	Number of overnight visitors to cross-country zone annually	49
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	5

Quill, Upper

NPS lake code: M-24-01

Current management: Stocked with nonreproducing fish. Limited reproduction has been observed in the past and needs to be verified. Located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	25
Secondary Drainage 1	Damnation Creek	Year initially stocked	1961
Secondary Drainage 2	Damnation Creek	Year last stocked	2002
Elevation	4,510 feet	Current stocking method	Backpack
UTM_E	626976.5000	Outside range of Caudata	—
UTM_N	5379435.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Skagit	AMMA present	Unknown
Maximum Depth	10 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	4,744.09 feet	AMGR present	—
Lake or pond surface area	1.2 acres	Number of times stocked since .....?	5
Median Epilimnetic (surface) water temperature	20°C	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Good	Meadow	50%
Shoreline development (ratio between perimeter and surface area)	1.053	Talus	50%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	7	Cliff	0%
Inflow type	Ephemeral or CP	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Despair
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No (M-24-02?)	Camp type	—
Index of connectivity	0.0	Distance to closest lake	48 feet
Observed fish reproduction	Yes. Stocked with nonreproducing fish. Limited reproduction has been observed in the past and needs to be verified.	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	OM	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.2 miles
Species/strains historically present	OM, OM(MW)	Number of overnight visitors to cross-country zone annually	49
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	5

Rainbow

NPS lake code: MR-14-01

Current management: Has reproducing fish; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	—
Secondary Drainage 1	Rainbow Creek	Year initially stocked	Unknown
Secondary Drainage 2	North Fork Rainbow Creek	Year last stocked	Unknown
Elevation	5,630 feet	Current stocking method	—
UTM_E	667416.1875	Outside range of Caudata	—
UTM_N	5363307.0000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	107.6 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,303.81 feet	AMGR present	No
Lake or pond surface area	15.5 acres	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	13.1°C	Forest	24%
TKN – median	0.045 mg/L	Shrub	33%
Fishing potential (based on Trailblazer data)	Good	Meadow	42%
Shoreline development (ratio between perimeter and surface area)	1.135	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	Mixed	Vegetation zone	High Forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Rainbow Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-13-01, MR-13-02)	Camp type	Hiker
Index of connectivity	0.5	Distance to closest lake	580 feet
Observed fish reproduction	Yes	Accessible by horseback	Yes
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	OM(PL)	Trail to lake	Yes
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OM(PL)	Number of overnight visitors to nearest camp annually	132
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	13

Rainbow, Upper (North)

NPS lake code: MR-13-01

Current management: Fishless (last stocked in 1988); located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	Rainbow Creek	Year initially stocked	1984
Secondary Drainage 2	North Fork Rainbow Creek	Year last stocked	1988
Elevation	5,900 feet	Current stocking method	Backpack; unknown
UTM_E	666789.5313	Outside range of Caudata	—
UTM_N	5363271.2500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	7.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	718.50 feet	AMGR present	No
Lake or pond surface area	0.6 acre	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	15.7°C	Forest	0%
TKN – median	0.0525 mg/L	Shrub	38%
Fishing potential (based on Trailblazer data)	Poor	Meadow	33%
Shoreline development (ratio between perimeter and surface area)	1.216	Talus	29%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	0	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Rainbow Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-14-01, MR-13-02)	Camp type	Hiker
Index of connectivity	0.4	Distance to closest lake	580 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM(PL), OM(MW)	Number of overnight visitors to nearest camp annually	132
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	—

Rainbow, Upper (South)

NPS lake code: MR-13-02

Current management: Stocked; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	70
Secondary Drainage 1	Rainbow Creek	Year initially stocked	1984
Secondary Drainage 2	North Fork Rainbow Creek	Year last stocked	1996
Elevation	5,865 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	666823.4688	Outside range of Caudata	—
UTM_N	5363115.0000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	24.1 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,683.07 feet	AMGR present	No
Lake or pond surface area	3.6 acres	Number of times stocked since .....?	5
Median Epilimnetic (surface) water temperature	10.6°C	Forest	0%
TKN – median	0.029 mg/L	Shrub	8%
Fishing potential (based on Trailblazer data)	Poor	Meadow	18%
Shoreline development (ratio between perimeter and surface area)	1.203	Talus	74%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Perennial	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Rainbow Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-14-01, MR-13-01)	Camp type	Hiker
Index of connectivity	0.4	Distance to closest lake	593 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM(PL), OM(MW)	Number of overnight visitors to nearest camp annually	132
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	13

Rainbow, Upper (West)

NPS lake code: MM-11-01

Current management: Stocked; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	Rainbow Creek North Stehekin River	Year initially stocked	1988
Secondary Drainage 2	North Fork Rainbow Creek	Year last stocked	1989
Elevation	6,473 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	666407.3438	Outside range of Caudata	Yes
UTM_N	5363463.7500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	—
County	Chelan	AMMA present	No
Maximum Depth	27.6 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,804.46 feet	AMGR present	No
Lake or pond surface area	3.5 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	13.4°C	Forest	0%
TKN – median	0.017 mg/L	Shrub	13%
Fishing potential (based on Trailblazer data)	Poor	Meadow	16%
Shoreline development (ratio between perimeter and surface area)	1.296	Talus	60%
Inlet or outlet	Yes	Bedrock	11%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Rainbow Lake
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	Yes
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM(MW)	Number of overnight visitors to nearest camp annually	132
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	13

Redoubt

NPS lake code: MC-11-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	1967
Secondary Drainage 2	Depot Creek	Year last stocked	1967
Elevation	5,300 feet	Current stocking method	—
UTM_E	623611.1250	Outside range of Caudata	Yes
UTM_N	5425716.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	45.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,487.53 feet	AMGR present	No
Lake or pond surface area	18.4 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	9.3°C	Forest	0%
TKN – median	0.05 mg/L	Shrub	4%
Fishing potential (based on Trailblazer data)	Poor	Meadow	3%
Shoreline development (ratio between perimeter and surface area)	1.099	Talus	94%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Depot
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-35-01, MC-34-02, MC-34-01, MS-04-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	547 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.1 miles
Species/strains historically present	OCL(TL)	Number of overnight visitors to cross-country zone annually	20
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Reveille, Lower

NPS lake code: MC-21-02

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	1968
Secondary Drainage 2	Indian Creek	Year last stocked	1968
Elevation	4,995 feet	Current stocking method	—
UTM_E	619726.3438	Outside range of Caudata	Yes
UTM_N	5417184.2500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	9.8 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,669.95 feet	AMGR present	—
Lake or pond surface area	4.4 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	13.8°C	Forest	15%
TKN – median	0.003 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Poor	Meadow	43%
Shoreline development (ratio between perimeter and surface area)	1.123	Talus	41%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Perennial	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Bear Mountain
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-21-01, MC-21-04, MC-50-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	11 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	30
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Reveille, Upper

NPS lake code: MC-21-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	1968
Secondary Drainage 2	Indian Creek	Year last stocked	1968
Elevation	4,995 feet	Current stocking method	—
UTM_E	619587.8750	Outside range of Caudata	Yes
UTM_N	5417070.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	16.4 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,273.62 feet	AMGR present	No
Lake or pond surface area	3.4 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	8°C	Forest	0%
TKN – median	0.02 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Poor	Meadow	4%
Shoreline development (ratio between perimeter and surface area)	1.672	Talus	96%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Subsurface	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Bear Mountain
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-21-02, MC-21-04, MC-50-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	11 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	30
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Ridley

NPS lake code: HM-03-01

Current management: Stocked; located in Ross Lake NRA.

Major Drainage	Ross	Stocking density (fish/acre)	50
Secondary Drainage 1	Northeast Ross Lake	Year initially stocked	1975
Secondary Drainage 2	Hozomeen Creek	Year last stocked	2000
Elevation	3,140 feet	Current stocking method	Backpack
UTM_E	644253.3750	Outside range of Caudata	—
UTM_N	5423441.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	35.1 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	2,782.15 feet	AMGR present	Yes
Lake or pond surface area	10.9 acres	Number of times stocked since .....?	9
Median Epilimnetic (surface) water temperature	18.2°C	Forest	100%
TKN – median	0.194 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Good	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.140	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Low forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Willow Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (HM-02-01, Ross Lake)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	4,961 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW), OM(RL)	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM(MW), OM(MW)	Number of overnight visitors to nearest camp annually	32
Stocking frequency (years of cycle)	3	Number of anglers annually (based on 10% assumption of total visitors)	3

Sky
NPS lake code: EP-13-01

Current management: Fishless; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Newhalem Creek	Year initially stocked	1968
Secondary Drainage 2	Newhalem Creek	Year last stocked	1968
Elevation	5,380 feet	Current stocking method	—
UTM_E	632819.1563	Outside range of Caudata	Yes
UTM_N	5381596.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	1,085.96 feet	AMGR present	—
Lake or pond surface area	10.9 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	37%
Fishing potential (based on Trailblazer data)	Poor	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.053	Talus	63%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Stout Lake
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (EP-15-01, EP-09-01, EP-09-02)	Camp type	—
Index of connectivity	—	Distance to closest lake	2,200 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	45
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Skymo

NPS lake code: PM-03-01

Current management: Has reproducing fish and is stocked; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	50
Secondary Drainage 1	West Ross Lake	Year initially stocked	1968
Secondary Drainage 2	Skymo Creek	Year last stocked	1998
Elevation	5,277 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	639305.3438	Outside range of Caudata	—
UTM_N	5410778.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	No
Maximum Depth	20 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,750 feet	AMGR present	No
Lake or pond surface area	10.8 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	11.1°C	Forest	0%
TKN – median	0.04 mg/L	Shrub	28%
Fishing potential (based on Trailblazer data)	Good	Meadow	14%
Shoreline development (ratio between perimeter and surface area)	1.541	Talus	58%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Prophet
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (PM-04-01, PM-02-01, Ross Lake)	Camp type	—
Index of connectivity	0.5	Distance to closest lake	82 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	—
Reproducing species present	OCL	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	2.5 miles
Species/strains historically present	OC, OM(MW)	Number of overnight visitors to cross-country zone annually	3
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	0

Sourdough

NPS lake code: PM-12-01

Current management: Has reproducing fish and is stocked; located in the north unit of the national park.

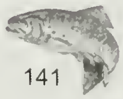
Major Drainage	Ross	Stocking density (fish/acre)	100
Secondary Drainage 1	Pierce Creek	Year initially stocked	1993
Secondary Drainage 2		Year last stocked	1998
Elevation	4,623 feet	Current stocking method	Fixed-wing aircraft; unknown
UTM_E	637939.7500	Outside range of Caudata	—
UTM_N	5402168.2500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Unknown
Maximum Depth	107 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	5,045.93 feet	AMGR present	—
Lake or pond surface area	27.6 acres	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	14.7°C	Forest	6%
TKN – median	—	Shrub	51%
Fishing potential (based on Trailblazer data)	Good	Meadow	12%
Shoreline development (ratio between perimeter and surface area)	1.298	Talus	31%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	6	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Sourdough/Trail
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Sourdough
Lake shares drainage with other lakes (other lakes denoted)	Yes (Ross Lake)	Camp type	Hiker
Index of connectivity	-0.5	Distance to closest lake	5,272 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	SF	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.2 miles
Species/strains historically present	SF, OM(MW)	Number of overnight visitors to cross-country zone or nearest camp annually	92
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	9

Sourpuss

NPS lake code: ML-01-01

Current management: Fishless; located in the south unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	—
Secondary Drainage 1	Ruby Creek	Year initially stocked	1968
Secondary Drainage 2	Panther Creek	Year last stocked	1968
Elevation	4,835 feet	Current stocking method	—
UTM_E	649358.8125	Outside range of Caudata	Yes
UTM_N	5385817.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	No
Maximum Depth	3.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,856.96 feet	AMGR present	No
Lake or pond surface area	2 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	7.8°C	Forest	0%
TKN – median	0.03 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Poor	Meadow	70%
Shoreline development (ratio between perimeter and surface area)	1.781	Talus	30%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Perennial	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Ragged Ridge
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (ML-02-01, ML-03-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	6,589 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	28
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—



Stiletto

NPS lake code: MR-01-01

Current management: Stocked; located in the south unit of the national park.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	Bridge Creek	Year initially stocked	1966
Secondary Drainage 2	East Fork Bridge Creek	Year last stocked	1995
Elevation	6,795 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	673284.4063	Outside range of Caudata	Yes
UTM_N	5372325.7500	Caudata survey done	—
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	—
County	Chelan	AMMA present	—
Maximum Depth	85.3 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,680.45 feet	AMGR present	—
Lake or pond surface area	9.9 acres	Number of times stocked since .....?	6
Median Epilimnetic (surface) water temperature	6.1°C	Forest	0%
TKN – median	0.07 mg/L	Shrub	42%
Fishing potential (based on Trailblazer data)	Fair	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.152	Talus	58%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	4	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Stiletto
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-04-01, MR-02-01, MR-03-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	1,455 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	0.6 mile
Species/strains historically present	OMA, OCL(TL), OM(MW)	Number of overnight visitors to cross-country zone annually	57
Stocking frequency (years of cycle)	6	Number of anglers annually (based on 10% assumption of total visitors)	6

Stout

NPS lake code: EP-09-02

Current management: Reproducing population of OCL is being replaced through stocking with OCC located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	100
Secondary Drainage 1	Newhalem Creek	Year initially stocked	1953
Secondary Drainage 2	Newhalem Creek	Year last stocked	1967
Elevation	5,215 feet	Current stocking method	Backpack; unknown
UTM_E	633112.7188	Outside range of Caudata	Yes
UTM_N	5383417.2500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	—
Maximum Depth	175.5 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	4,169.95 feet	AMGR present	—
Lake or pond surface area	25.2 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	5.4°C	Forest	5%
TKN – median	—	Shrub	45%
Fishing potential (based on Trailblazer data)	Good	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.122	Talus	50%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	4	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Stout Lake
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (EP-09-01, EP-13-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	100 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	OCL	Trail to lake	No
Stocked spp/strain present	OCC	Line of sight distance to trail	1.9 miles
Species/strains historically present	OCC, OCL	Number of overnight visitors to cross-country zone annually	45
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	5

Stout, Lower

NPS lake code: EP-09-01

Current management: Has reproducing fish; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Newhalem Creek	Year initially stocked	NA
Secondary Drainage 2	Newhalem Creek	Year last stocked	NA
Elevation	5,190 feet	Current stocking method	—
UTM_E	632806.7813	Outside range of Caudata	Yes
UTM_N	5383341.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	No
Maximum Depth	8.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	862.86 feet	AMGR present	No
Lake or pond surface area	1 acre	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	13.2°C	Forest	0%
TKN – median	0.04 mg/L	Shrub	35%
Fishing potential (based on Trailblazer data)	Good	Meadow	55%
Shoreline development (ratio between perimeter and surface area)	1.188	Talus	10%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Stout Lake
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (EP-09-02, EP-13-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	100 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	OCL	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OCL	Number of overnight visitors to cross-country zone annually	45
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	5

Sweet Pea

NPS lake code: ML-02-01

Current management: Stocked; located in the south unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	40
Secondary Drainage 1	Ruby Creek	Year initially stocked	1968
Secondary Drainage 2	Panther Creek	Year last stocked	1999
Elevation	5,540 feet	Current stocking method	Backpack; unknown
UTM_E	651671.9375	Outside range of Caudata	Yes
UTM_N	5384916.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	No
Maximum Depth	92 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,123.36 feet	AMGR present	No
Lake or pond surface area	10.3 acres	Number of times stocked since .....?	5
Median Epilimnetic (surface) water temperature	6.5°C	Forest	0%
TKN – median	0.01 mg/L	Shrub	23%
Fishing potential (based on Trailblazer data)	Poor	Meadow	10%
Shoreline development (ratio between perimeter and surface area)	1.316	Talus	35%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	5	Cliff	31%
Inflow type	East	Vegetation zone	High forest
Number of outflow streams	1	Cross-country zone	Ragged Ridge
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (ML-03-01, ML-01-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	807 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.9 miles
Species/strains historically present	OM(MW), OM	Number of overnight visitors to cross-country zone annually	28
Stocking frequency (years of cycle)	6	Number of anglers annually (based on 10% assumption of total visitors)	3

Talus Tarn

NPS lake code: M-06-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Bacon Creek	Year initially stocked	1968
Secondary Drainage 2	Upper Bacon Creek	Year last stocked	1980
Elevation	5,355 feet	Current stocking method	—
UTM_E	610710.9375	Outside range of Caudata	—
UTM_N	5396502.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	11.8 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,217.19 feet	AMGR present	No
Lake or pond surface area	1.5 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	11.7°C	Forest	0%
TKN – median	0.018 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	None	Meadow	10%
Shoreline development (ratio between perimeter and surface area)	1.337	Talus	90%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Subsurface	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Berdeen
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-07-01, M-04-01, M-05-01, M-08-01, M-09-01)	Camp type	—
Index of connectivity	0.2	Distance to closest lake	2,998 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	3.7 miles
Species/strains historically present	OMA	Number of overnight visitors to cross-country zone annually	48
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Tapto, Lower

NPS lake code: MC-17-03

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	1960
Secondary Drainage 2	Brush Creek	Year last stocked	1960
Elevation	5,700 feet	Current stocking method	—
UTM_E	619691.6250	Outside range of Caudata	Yes
UTM_N	5415382.5000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	518.37 feet	AMGR present	—
Lake or pond surface area	0.4 acre	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	16%
Fishing potential (based on Trailblazer data)	Poor	Meadow	22%
Shoreline development (ratio between perimeter and surface area)	1.144	Talus	63%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Whatcom
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-17-02, MC-17-01, MC-17-04)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	63 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OCL(TL)	Number of overnight visitors to nearest camp annually	211
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Tapto, Middle

NPS lake code: MC-17-02

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	1960
Secondary Drainage 2	Brush Creek	Year last stocked	1960
Elevation	5,730 feet	Current stocking method	—
UTM_E	619647.8125	Outside range of Caudata	Yes
UTM_N	5415481.5000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	18 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	938.32 feet	AMGR present	—
Lake or pond surface area	1.2 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	12.9°C	Forest	0%
TKN – median	0.02 mg/L	Shrub	58%
Fishing potential (based on Trailblazer data)	Poor	Meadow	42%
Shoreline development (ratio between perimeter and surface area)	1.141	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Tapto Lakes/Trail
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Whatcom
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-17-01, MC-17-03, MC-17-04)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	55 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	64
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Tapto, Upper

NPS lake code: MC-17-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	1960
Secondary Drainage 2	Brush Creek	Year last stocked	1960
Elevation	5,750 feet	Current stocking method	—
UTM_E	619638.3125	Outside range of Caudata	Yes
UTM_N	5415689.2500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	43 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,677.17 feet	AMGR present	—
Lake or pond surface area	10.2 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	0.008 mg/L	Shrub	28%
Fishing potential (based on Trailblazer data)	Poor	Meadow	10%
Shoreline development (ratio between perimeter and surface area)	1.131	Talus	62%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Tapto Lakes/Trail
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Whatcom
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-17-02, MC-17-03, MC-17-04)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	55 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OCL(TL)	Number of overnight visitors to cross-country zone annually	64
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Tapto, West

NPS lake code: MC-17-04

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Chilliwack	Stocking density (fish/acre)	—
Secondary Drainage 1	Chilliwack River	Year initially stocked	1960
Secondary Drainage 2	Brush Creek	Year last stocked	1960
Elevation	5,660 feet	Current stocking method	—
UTM_E	619300.4375	Outside range of Caudata	Yes
UTM_N	5415633.0000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	14.1 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,348.43 feet	AMGR present	—
Lake or pond surface area	2.3 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	11.7°C	Forest	0%
TKN – median	0.024 mg/L	Shrub	15%
Fishing potential (based on Trailblazer data)	Poor	Meadow	85%
Shoreline development (ratio between perimeter and surface area)	1.196	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Whatcom
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-17-03, MC-17-02, MC-17-01)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	1,700 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OCL(TL)	Number of overnight visitors to nearest camp annually	211
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Thornton, Lower

NPS lake code: M-20-01

Current management: May have limited population of reproducing fish and is also stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	50
Secondary Drainage 1	Thornton Creek	Year initially stocked	1941
Secondary Drainage 2		Year last stocked	1998
Elevation	4,486 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	623160.9688	Outside range of Caudata	—
UTM_N	5393495.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	108.3 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	6,204.07 feet	AMGR present	No
Lake or pond surface area	55.1 acres	Number of times stocked since .....?	11
Median Epilimnetic (surface) water temperature	12.2°C	Forest	0%
TKN – median	0.053 mg/L	Shrub	77%
Fishing potential (based on Trailblazer data)	Good	Meadow	6%
Shoreline development (ratio between perimeter and surface area)	1.130	Talus	13%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	4%
Inflow type	CP	Vegetation zone	High forest
Number of outflow streams	—	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Thornton Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-19-01, MC-20-01)	Camp type	Hiker
Index of connectivity	-0.3	Distance to closest lake	327 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	No
Reproducing species present	OCL(TL)	Trail to lake	Yes
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	—
Species/strains historically present	OM, OM(ST), OM(MW), OMA, OCC, OCL(TL)	Number of overnight visitors to nearest camp annually	203
Stocking frequency (years of cycle)	6	Number of anglers annually (based on 10% assumption of total visitors)	20

Thornton, Middle

NPS lake code: M-19-01

Current management: Stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	50
Secondary Drainage 1	Thornton Creek	Year initially stocked	1941
Secondary Drainage 2		Year last stocked	1997
Elevation	4,700 feet	Current stocking method	Backpack; unknown
UTM_E	622610.1250	Outside range of Caudata	Yes
UTM_N	5394101.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	78.7 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	3,080.71 feet	AMGR present	No
Lake or pond surface area	11.9 acres	Number of times stocked since .....?	10
Median Epilimnetic (surface) water temperature	8.2°C	Forest	0%
TKN – median	0.035 mg/L	Shrub	5%
Fishing potential (based on Trailblazer data)	Fair	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.207	Talus	82%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	4	Cliff	13%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Thornton Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-20-01, M-18-01)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	327 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	Yes
Stocked spp/strain present	OMA	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM, OM(ST), OMA	Number of overnight visitors to nearest camp annually	203
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	20

Thunder

NPS lake code: RD-02-01

Current management: Fishless (last stocked 10 years ago); located in Ross Lake NRA.

Major Drainage	Skagit	Stocking density (fish/acre)	50
Secondary Drainage 1	Thunder Creek	Year initially stocked	1947
Secondary Drainage 2		Year last stocked	1992
Elevation	1,350 feet	Current stocking method	—
UTM_E	639270.1875	Outside range of Caudata	—
UTM_N	5395295.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	—
Maximum Depth	24.6 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	3,047.90 feet	AMGR present	Yes
Lake or pond surface area	6.8 acres	Number of times stocked since .....?	28
Median Epilimnetic (surface) water temperature	15.3°C	Forest	42%
TKN – median	0.012 mg/L	Shrub	42%
Fishing potential (based on Trailblazer data)	Fair	Meadow	15%
Shoreline development (ratio between perimeter and surface area)	1.583	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Low forest
Number of outflow streams	0	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	—
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OCL(TL), OCC, OM, OM(MW), OM(STAC)	Number of overnight visitors to cross-country zone annually	0
Stocking frequency (years of cycle)	3,5	Number of anglers annually (based on 10% assumption of total visitors)	—

Tiny

NPS lake code: MC-15-01

Current management: Fishless; located in the north unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	—
Secondary Drainage 1	Northwest Ross Lake	Year initially stocked	Unknown
Secondary Drainage 2	Upper Little Beaver Creek	Year last stocked	Unknown
Elevation	6,100 feet	Current stocking method	—
UTM_E	621312.6563	Outside range of Caudata	Yes
UTM_N	5416078.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	6 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	492.13 feet	AMGR present	No
Lake or pond surface area	0.3 acre	Number of times stocked since .....?	—
Median Epilimnetic (surface) water temperature	17°C	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Poor	Meadow	50%
Shoreline development (ratio between perimeter and surface area)	1.210	Talus	50%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	Subsurface	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Middle Lakes
Isolated from any other lake or pond within 2,000 feet	No	Camp name	Twin Rocks
Lake shares drainage with other lakes (other lakes denoted)	Yes (MC-16-02, MC-14-01, MC-14-02, MC-22-01, . . .)	Camp type	Hiker/stock
Index of connectivity	—	Distance to closest lake	696 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	1.2 miles
Species/strains historically present	OC	Number of overnight visitors to cross-country zone annually	13
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Torment

NPS lake code: ML-03-01

Current management: Stocked; located in the south unit of the national park.

Major Drainage	Ross	Stocking density (fish/acre)	40
Secondary Drainage 1	Ruby Creek	Year initially stocked	1985
Secondary Drainage 2	Panther Creek	Year last stocked	1995
Elevation	6,560 feet	Current stocking method	Backpack
UTM_E	651475.3750	Outside range of Caudata	Yes
UTM_N	5384099.2500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	No
Maximum Depth	49.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,653.54 feet	AMGR present	No
Lake or pond surface area	3.6 acres	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	14.1°C	Forest	0%
TKN – median	0.04 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Good	Meadow	5%
Shoreline development (ratio between perimeter and surface area)	1.183	Talus	95%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	4	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Ragged Ridge
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (ML-02-01, ML-01-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	807 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.9 miles
Species/strains historically present	OM(MW)	Number of overnight visitors to cross-country zone annually	28
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	3

Trapper

NPS lake code: GM-01-01

Current management: Has reproducing fish; located in the south unit of the national park.

Major Drainage	Stehekin	Stocking density (fish/acre)	—
Secondary Drainage 1	Upper Stehekin River	Year initially stocked	1948
Secondary Drainage 2		Year last stocked	1968
Elevation	4,165 feet	Current stocking method	—
UTM_E	647784.5313	Outside range of Caudata	Yes
UTM_N	5366904.0000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	—
County	Chelan	AMMA present	No
Maximum Depth	160.8 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	11,597.77 feet	AMGR present	No
Lake or pond surface area	147.2 acres	Number of times stocked since .....?	9
Median Epilimnetic (surface) water temperature	8°C	Forest	21%
TKN – median	0.019 mg/L	Shrub	43%
Fishing potential (based on Trailblazer data)	Poor	Meadow	12%
Shoreline development (ratio between perimeter and surface area)	1.292	Talus	24%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	3	Cliff	0%
Inflow type	Perennial	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Trapper inlet and outlet
Lake shares drainage with other lakes (other lakes denoted)	Yes (CP-01-01, CP-02-01)	Camp type	Cross-country
Index of connectivity	—	Distance to closest lake	6,331 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OC	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OC	Number of overnight visitors to nearest camp annually	90
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	9

Triplet, Lower

NPS lake code: SM-02-01

Current management: Has reproducing fish; located in Lake Chelan NRA.

Major Drainage	Lake Chelan	Stocking density (fish/acre)	—
Secondary Drainage 1	Four Mile Creek	Year initially stocked	1972
Secondary Drainage 2		Year last stocked	1972
Elevation	6,331 feet	Current stocking method	—
UTM_E	681338.0938	Outside range of Caudata	—
UTM_N	5351529.0000	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	No
Maximum Depth	7.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,341.86 feet	AMGR present	No
Lake or pond surface area	2.2 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	17.5°C	Forest	0%
TKN – median	0.06 mg/L	Shrub	48%
Fishing potential (based on Trailblazer data)	Fair	Meadow	46%
Shoreline development (ratio between perimeter and surface area)	1.214	Talus	6%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Perennial	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Triplet Lakes
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (SM-02-02, SM-01-01)	Camp type	—
Index of connectivity	-0.2	Distance to closest lake	332 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OCL(TL)	Number of overnight visitors to cross-country zone annually	9
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	1

Triplet, Upper

NPS lake code: SM-02-02

Current management: Has reproducing fish; located in Lake Chelan NRA.

Major Drainage	Lake Chelan	Stocking density (fish/acre)	—
Secondary Drainage 1	Four Mile Creek	Year initially stocked	1972
Secondary Drainage 2		Year last stocked	1972
Elevation	6,551 feet	Current stocking method	—
UTM_E	681644.5625	Outside range of Caudata	Yes
UTM_N	5351352.2500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	—
County	Chelan	AMMA present	No
Maximum Depth	12.5 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,459.97 feet	AMGR present	No
Lake or pond surface area	2.3 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	19.7°C	Forest	0%
TKN – median	0.03 mg/L	Shrub	35%
Fishing potential (based on Trailblazer data)	Good	Meadow	33%
Shoreline development (ratio between perimeter and surface area)	1.278	Talus	31%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Triplet Lakes
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (SM-02-01, SM-01-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	332 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	Yes	Trailhead outside the park	—
Reproducing species present	OCL(TL)	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OCL(TL)	Number of overnight visitors to cross-country zone annually	9
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	1

Triumph

NPS lake code: M-17-01

Current management: Stocked; located in the north unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	20, 70
Secondary Drainage 1	Goodell Creek	Year initially stocked	1961
Secondary Drainage 2		Year last stocked	2002
Elevation	3,685 feet	Current stocking method	Backpack
UTM_E	618692.8438	Outside range of Caudata	—
UTM_N	5392884.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	Yes
County	Whatcom	AMMA present	Yes
Maximum Depth	20.5 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,768.37 feet	AMGR present	No
Lake or pond surface area	4.3 acres	Number of times stocked since .....?	7
Median Epilimnetic (surface) water temperature	17.1°C	Forest	0%
TKN – median	—	Shrub	7%
Fishing potential (based on Trailblazer data)	Good	Meadow	21%
Shoreline development (ratio between perimeter and surface area)	1.159	Talus	72%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	4	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Despair
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-15-01)	Camp type	—
Index of connectivity	0	Distance to closest lake	5,274 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	3.7 miles
Species/strains historically present	OMA, OM(MW)	Number of overnight visitors to cross-country zone annually	49
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	5

Unnamed

NPS lake code: FP-01-01

Current management: Fishless; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Thunder Creek	Year initially stocked	1967
Secondary Drainage 2	McAllister Creek	Year last stocked	1967
Elevation	5,140 feet	Current stocking method	—
UTM_E	638314.9688	Outside range of Caudata	Yes
UTM_N	5382925.5000	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	—
Maximum Depth	—	Within range of AMGR (northwestern salamander)	—
Perimeter	3,093.83 feet	AMGR present	—
Lake or pond surface area	13.5 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	—	Shrub	0%
Fishing potential (based on Trailblazer data)	Fair	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.138	Talus	100%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Alpine
Number of outflow streams	—	Cross-country zone	Klawatti
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (EP-10-01, EP-02-01, EP-11-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	399 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	—
Species/strains historically present	OM, OC	Number of overnight visitors to cross-country zone annually	193
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Unnamed

NPS lake code: MR-11-01

Current management: Stocked; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	50
Secondary Drainage 1	North Stehekin River	Year initially stocked	1990
Secondary Drainage 2	Rainbow Creek	Year last stocked	2002
Elevation	6,111 feet	Current stocking method	Backpack
UTM_E	671232.4063	Outside range of Caudata	—
UTM_N	5364761.2500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	28.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,404.20 feet	AMGR present	No
Lake or pond surface area	2.9 acres	Number of times stocked since .....?	3
Median Epilimnetic (surface) water temperature	14.6°C	Forest	0%
TKN – median	0.06 mg/L	Shrub	70%
Fishing potential (based on Trailblazer data)	Fair	Meadow	0%
Shoreline development (ratio between perimeter and surface area)	1.124	Talus	30%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Trail/Rainbow Ridge
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	RRC01
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-18-01, MR-15-01, MR-15-02, MR-12-01, MR-16-01)	Camp type	Cross-country
Index of connectivity	0.4	Distance to closest lake	2,286 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.2 miles
Species/strains historically present	OC, OM, OM(MW)	Number of overnight visitors to cross-country zone annually	6
Stocking frequency (years of cycle)	5	Number of anglers annually (based on 10% assumption of total visitors)	0

Unnamed

NPS lake code: MR-16-01

Current management: Has limited population of reproducing fish; located in Lake Chelan NRA.

Major Drainage	Stehekin	Stocking density (fish/acre)	—
Secondary Drainage 1	North Stehekin River	Year initially stocked	1983
Secondary Drainage 2	Rainbow Creek	Year last stocked	1983
Elevation	6,230 feet	Current stocking method	—
UTM_E	672989.9688	Outside range of Caudata	—
UTM_N	5362254.7500	Caudata survey done	Yes
Side of Pacific Crest	East	Within range of AMMA (long-toed salamander)	Yes
County	Chelan	AMMA present	Yes
Maximum Depth	6.6 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	1,167.98 feet	AMGR present	No
Lake or pond surface area	1.9 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	—	Forest	0%
TKN – median	0.055 mg/L	Shrub	57%
Fishing potential (based on Trailblazer data)	Good	Meadow	43%
Shoreline development (ratio between perimeter and surface area)	1.157	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Rennie
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (MR-11-01, MR-12-01, MR-18-01, MR-15-01, MR-15-02)	Camp type	—
Index of connectivity	0.2	Distance to closest lake	4,994 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	No
Reproducing species present	OC	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	1.2 miles
Species/strains historically present	OM(MW), OC	Number of overnight visitors to cross-country zone annually	7
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	1

Vulcan

NPS lake code: ML-04-01

Current management: Fishless; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Thunder Creek	Year initially stocked	1968
Secondary Drainage 2	Fisher Creek	Year last stocked	1968
Elevation	5,180 feet	Current stocking method	—
UTM_E	650636.4063	Outside range of Caudata	Yes
UTM_N	5380712.0000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	No
Maximum Depth	25.2 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,522.97 feet	AMGR present	No
Lake or pond surface area	8.2 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	10.7°C	Forest	21%
TKN – median	0.03 mg/L	Shrub	23%
Fishing potential (based on Trailblazer data)	Fair	Meadow	15%
Shoreline development (ratio between perimeter and surface area)	1.190	Talus	41%
Inlet or outlet	No	Bedrock	0%
Number of inflow streams	1	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Logan
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	No	Camp type	—
Index of connectivity	—	Distance to closest lake	—
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	No	Trailhead outside the park	Yes
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	0.6 mile
Species/strains historically present	OM(HG)	Number of overnight visitors to cross-country zone annually	129
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Wilcox/Lillie, Upper

NPS lake code: EP-06-01

Current management: Has reproducing fish; located in the south unit of the national park.			
Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Newhalem Creek	Year initially stocked	1967
Secondary Drainage 2	East Fork Newhalem Creek	Year last stocked	1991
Elevation	5,136 feet	Current stocking method	—
UTM_E	634874.9375	Outside range of Caudata	Yes
UTM_N	5384523.7500	Caudata survey done	—
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	—
Maximum Depth	65 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,683.73 feet	AMGR present	—
Lake or pond surface area	10.5 acres	Number of times stocked since .....?	1
Median Epilimnetic (surface) water temperature	14.5°C	Forest	7%
TKN – median	0.024 mg/L	Shrub	25%
Fishing potential (based on Trailblazer data)	Good	Meadow	49%
Shoreline development (ratio between perimeter and surface area)	1.118	Talus	19%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	5	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Stout Lake
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (EP-05-01, EP-03-01, EP-04-01, EP-01-01, DD-08-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	76 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	OC, OM, OMxOC	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	2.5 miles
Species/strains historically present	OC, OM, OM(MW)	Number of overnight visitors to cross-country zone annually	45
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	5

Wilcox/Sandie, Lower

NPS lake code: EP-05-01

Current management: Has reproducing fish and is stocked; located in the south unit of the national park.

Major Drainage	Skagit	Stocking density (fish/acre)	70
Secondary Drainage 1	Newhalem Creek	Year initially stocked	1967
Secondary Drainage 2	East Fork Newhalem Creek	Year last stocked	1993
Elevation	5,120 feet	Current stocking method	Backpack; fixed-wing aircraft
UTM_E	634611.8125	Outside range of Caudata	Yes
UTM_N	5384573.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Skagit	AMMA present	No
Maximum Depth	19.7 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	2,296.59 feet	AMGR present	No
Lake or pond surface area	5.4 acres	Number of times stocked since .....?	4
Median Epilimnetic (surface) water temperature	13.5°C	Forest	29%
TKN – median	0.03 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Good	Meadow	4%
Shoreline development (ratio between perimeter and surface area)	1.335	Talus	67%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	Mixed	Vegetation zone	Subalpine
Number of outflow streams	1	Cross-country zone	Stout Lake
Isolated from any other lake or pond within 2,000 feet	No	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (EP-06-01, EP-03-01, EP-04-01, EP-01-01, DD-08-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	76 feet
Observed fish reproduction	Yes	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	OC	Trail to lake	No
Stocked spp/strain present	OM(MW)	Line of sight distance to trail	1.9 miles
Species/strains historically present	OC, OM, OM(MW)	Number of overnight visitors to cross-country zone annually	45
Stocking frequency (years of cycle)	4	Number of anglers annually (based on 10% assumption of total visitors)	5

Wild

NPS lake code: MC-27-01

Current management: Fishless; located in the north unit of the national park.

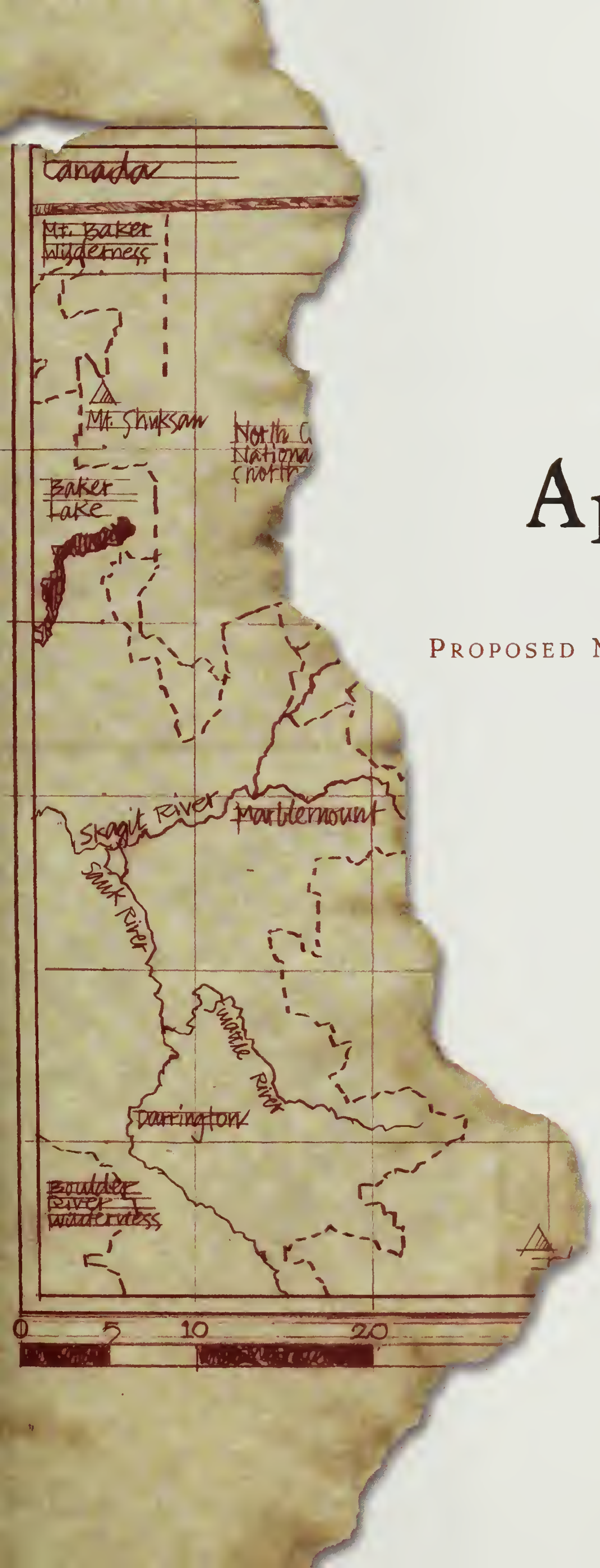
Major Drainage	Skagit	Stocking density (fish/acre)	—
Secondary Drainage 1	Goodell Creek	Year initially stocked	1967
Secondary Drainage 2	Upper Goodell Creek	Year last stocked	1967
Elevation	4,880 feet	Current stocking method	—
UTM_E	619985.9375	Outside range of Caudata	Yes
UTM_N	5405364.7500	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	28.9 feet	Within range of AMGR (northwestern salamander)	—
Perimeter	4,288.06 feet	AMGR present	No
Lake or pond surface area	12.7 acres	Number of times stocked since .....?	2
Median Epilimnetic (surface) water temperature	10.1°C	Forest	0%
TKN – median	0.0105 mg/L	Shrub	0%
Fishing potential (based on Trailblazer data)	Poor	Meadow	60%
Shoreline development (ratio between perimeter and surface area)	1.626	Talus	40%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	—	Cliff	0%
Inflow type	—	Vegetation zone	Subalpine
Number of outflow streams	—	Cross-country zone	Pioneer Ridge
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	None
Lake shares drainage with other lakes (other lakes denoted)	Yes (M-21-01, M-16-01, MC-13-01)	Camp type	—
Index of connectivity	—	Distance to closest lake	10,883 feet
Observed fish reproduction	—	Accessible by horseback	No
Observed spawning habitat present	—	Trailhead outside the park	—
Reproducing species present	—	Trail to lake	No
Stocked spp/strain present	—	Line of sight distance to trail	5.6 miles
Species/strains historically present	OM	Number of overnight visitors to cross-country zone annually	26
Stocking frequency (years of cycle)	—	Number of anglers annually (based on 10% assumption of total visitors)	—

Willow

NPS lake code: HM-04-01

Current management: Stocked; located in Ross Lake NRA.

Major Drainage	Ross	Stocking density (fish/acre)	25
Secondary Drainage 1	Northeast Ross Lake	Year initially stocked	1960
Secondary Drainage 2	Upper Lightning Creek	Year last stocked	2002
Elevation	2,853 feet	Current stocking method	Backpack; fixed-wing aircraft; unknown
UTM_E	646033.6875	Outside range of Caudata	—
UTM_N	5422914.5000	Caudata survey done	Yes
Side of Pacific Crest	West	Within range of AMMA (long-toed salamander)	—
County	Whatcom	AMMA present	No
Maximum Depth	26.9 feet	Within range of AMGR (northwestern salamander)	Yes
Perimeter	5,436.35 feet	AMGR present	Yes
Lake or pond surface area	16.9 acres	Number of times stocked since .....?	14
Median Epilimnetic (surface) water temperature	19.5°C	Forest	71%
TKN – median	0.12 mg/L	Shrub	7%
Fishing potential (based on Trailblazer data)	Good	Meadow	22%
Shoreline development (ratio between perimeter and surface area)	1.790	Talus	0%
Inlet or outlet	Yes	Bedrock	0%
Number of inflow streams	2	Cliff	0%
Inflow type	Ephemeral	Vegetation zone	Low forest
Number of outflow streams	1	Cross-country zone	None
Isolated from any other lake or pond within 2,000 feet	Yes	Camp name	Willow Lake
Lake shares drainage with other lakes (other lakes denoted)	Yes (Ross Lake)	Camp type	Hiker
Index of connectivity	—	Distance to closest lake	5,000 feet
Observed fish reproduction	—	Accessible by horseback	Yes
Observed spawning habitat present	No	Trailhead outside the park	No
Reproducing species present	—	Trail to lake	Yes
Stocked spp/strain present	OCC	Line of sight distance to trail	0
Species/strains historically present	OM, OM(MW), OC, OCL(TL)	Number of overnight visitors to nearest camp annually	32
Stocking frequency (years of cycle)	1	Number of anglers annually (based on 10% assumption of total visitors)	3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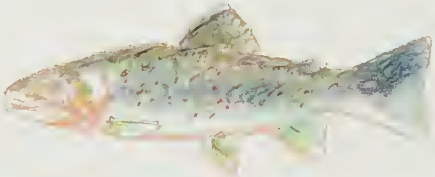

Appendix F

PROPOSED MOUNTAIN LAKES FISHERY MONITORING PLAN

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APPENDIX F: PROPOSED MOUNTAIN LAKES FISHERY MONITORING PLAN

APPENDIX F
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INTRODUCTION

Adaptive management is a central theme of the three action alternatives analyzed in this *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* for the 91 naturally formed mountain lakes in the North Cascades National Park Service Complex (North Cascades Complex). Monitoring of the 91 lakes is a key component of adaptive management. Adaptive management is based on the continuing, iterative process of applying management actions, monitoring consequences, evaluating monitoring results against objectives, adjusting management actions, and using feedback to make future management decisions. The adaptive management process for the 91 lakes in the study area would include evaluating the effects of management actions (for example, management of low densities of nonreproducing fish) on biological resources at individual lakes and identifying whether and how these practices should be modified to meet the objectives of the selected management action for the lakes. Monitoring activities would be selected and designed to test the success and effectiveness of management actions at each lake. This proposed mountain lakes fishery monitoring plan (monitoring plan) for the North Cascades Complex would provide the basis for the monitoring activities.

The specific objectives of the monitoring plan are listed below.

Reduce uncertainty of current conditions by gathering additional information where data are lacking.

Develop, if needed, and implement standardized protocols for data collection that are cost effective, efficient, and explicitly linked to management actions. Also, develop thresholds/criteria for data evaluation that will facilitate the adaptive management process.

Perform adaptive management by evaluating the success or failure of management actions to conserve/improve biological integrity and provide quality fishing opportunities.

Sampling under the proposed monitoring plan is not intended to replace monitoring that has been or is currently being performed under other programs in the North Cascades Complex (such as long-term monitoring). Instead, monitoring would use data already collected and implement sampling protocols developed and applied within the North Cascades Complex lakes. One notable example of established sampling methods is the set of sampling protocols prepared by Hoffman et al. (2003). Other aquatic monitoring efforts include

Long-term research by the National Park Service (NPS) that was initiated following the 1988 Supplemental Agreement. The research was performed with the support of the U.S. Geological Survey (USGS)-Biological Resources Division and Oregon State University and completed in 2002. Results of this research are summarized in the “Purpose of and Need for Action” chapter in the section titled “Summary of Existing Research.”

Management by the Washington Department of Fish and Wildlife (WDFW) of fishery resources in 17 stocked lakes and 23 lakes with self-sustaining (reproducing) fish populations in North Cascades National Park and all lakes in the Ross Lake and Lake Chelan National Recreation Areas. Two private groups, the Washington State Hi-Lakers and the Trail Blazers Inc., assist the WDFW in collecting fishery data.

This proposed monitoring plan is organized as follows:

Past Monitoring: Existing Data, Reliability of Data, Protocols Used—provides a summary of the known physical, chemical, and biological data collected at the 91 lakes in the North Cascades Complex that are the subject of the *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS).

Management Actions and Associated Monitoring Needs—for each management action, provides the needed monitoring efforts and objectives in table and flowchart formats.

Key Data Categories and Selection of Methods/Protocols for Monitoring—describes *key data* to be used during monitoring and recommends methods best suited for use in monitoring the results of the selected management actions.

Decision Support Framework—describes the basic elements in the process by which the Technical Advisory Committee (TAC) would make lake management decisions.

Adaptive Management Framework—discusses how the key data for each lake would be evaluated and interpreted to determine if a change in management direction would be needed.

Priorities for Monitoring—describes considerations that would be used when setting priorities as to which lakes would be monitored and which data are key to monitoring management activities.

References Cited

PAST MONITORING: EXISTING DATA, RELIABILITY OF DATA, PROTOCOLS USED

A variety of data have been collected from many of the 91 lakes in the North Cascades Complex. The most common physical characteristics, water temperature and depth, have been measured for approximately 75 of the 91 lakes. Outlet habitat type has only been estimated from Geographic Information System (GIS) data but not confirmed in the field. The 21 types of data (abiotic and biotic) collected from the 91 study area lakes are provided in table F-1. For each data type, the method used to collect the data and the reliability of the data are listed in the table, with additional explanation provided in footnotes. In most cases, fishless lakes have less data available than do lakes that currently have fish.

MANAGEMENT ACTIONS AND ASSOCIATED MONITORING NEEDS

The 91 lakes in the North Cascades Complex have been placed into one of four categories according to the fishery population found in the lake. The four categories are

1. Lakes that are currently fishless
2. Likes with high densities of reproducing fish
3. Lakes with low densities of reproducing fish
4. Lakes with nonreproducing fish.

Lake Information				tes	Zooplankton			Vegetation	
Lake Name	NPS Lake Code	TKN (mg/l)	Te	BMI ey	NOCA Presence Survey	OSU Presence Survey	OSU Density Survey	Riparian Vegetation	Aquatic Vegetation
Azure	MP-09-01							P	
Battalion	MLY-02-01	2				X		P	
Bear	MC-12-01	2				X		P	
Berdeen	M-08-01							P	
Berdeen (Lower)	M-07-01	2						P	
Berdeen (Upper)	M-09-01							P	
Blum (Largest/Middle, No. 3)	M-11-01				X			P	
Blum (Lower/West, No. 4)	LS-07-01	2			X			P	
Blum (Small/North, No. 2)	MC-01-01	2			X			P	
Blum (Vista/Northwest, No. 1)	MC-02-01	2			X			X	X
Bouck, Lower	DD-04-01	2				X		P	
Bouck, Upper	DD-05-01	1						X	X
Bowan	MR-12-01	1				X	X	P	
Coon	MM-10-01	1			X	X		P	
Copper	MC-06-01	1				X		X	X
Dagger	MR-04-01	1			X	X	X	P	
Dee Dee, Upper	MR-15-01	1				X		X	X
Dee Dee/Tamarack, Lower	MR-15-02	1				X	X	X	X
Despair, Lower	M-14-01							P	
Despair, Upper	M-13-01							P	
Diobsud No. 1	LS-01-01	1				X	X	X	X
Diobsud No. 2, Lower	LS-02-01	1				X	X	P	
Diobsud No. 3, Upper	LS-03-01	1				X		P	
Doubtful	CP-01-01	1			X	X		X	X
Doug's Tarn	M-21-01	2						P	
East, Lower	MC-14-02							X	X
East, Upper	MC-14-01							X	X
Firn	MP-02-01							X	X
Green	M-04-01							P	
Green Bench	LS-04-01							X	X
Hanging	MC-08-01							P	
Hidden	SB-01-01				X			P	
Hidden Lake Tarn	EP-14-01							X	X
Hi-Yu	M-01-01	1						X	X
Hozomeen	HM-02-01	1			X	X		X	X
Ipsoot	LS-06-01							P	
Jeanita	DD-01-01	1			X			P	

TABLE F-1: NORTH CASCADES COMPLEX SURVEYS FOR 91 LAKES IN THE STUDY AREA—PROTOCOLS, DATA CATEGORIES, AND RELIABILITY OF DATA[a]

Lake Information		Abiotic Data Categories						Biotic Data Categories														
								Fish					Amphibian			Benthic Macroinvertebrates		Zooplankton			Vegetation	
Lake Name	NPS Lake Code	TKN (mg/l)	Surface Water Temperature	Lake Depth	Substrate	Available Spawning Habitat	Outlet Habitat Type	Fish Presence	Fish Reproductive Status	Fish Species Present	Density of Reproducing Fish	Status of Fish Population in Outlet	Snorkel Survey	Visual Survey	Trap Survey	OSU BMI Survey	NOCA BMI Survey	NOCA Presence Survey	OSU Presence Survey	OSU Density Survey	Riparian Vegetation	Aquatic Vegetation
Azure	MP-09-01		1	X				Fishless													P	
Battalion	MLY-02-01	2	1	X				1	2	2	2	3	2	1	1	X			X		P	
Bear	MC-12-01	2	1	X				1	1	1	2	3				X			X		P	
Berdeen	M-08-01		2	X				1	1	2	2	2									P	
Berdeen (Lower)	M-07-01	2	2	X				1	1	2	2	3	2	3							P	
Berdeen (Upper)	M-09-01		2					2	2	2	3	2									P	
Blum (Largest/Middle, No. 3)	M-11-01		2		X			1	2	1	2	3						X			P	
Blum (Lower/West, No. 4)	LS-07-01	2	1	X	X			1	1	1	1	3	2					X			P	
Blum (Small/North, No. 2)	MC-01-01	2	2	X	X			Fishless					2					X			P	
Blum (Vista/Northwest, No. 1)	MC-02-01	2	1	X	X			Fishless					2				X	X			X	X
Bouck, Lower	DD-04-01	2	2	X				1	1	1	3	3				X			X		P	
Bouck, Upper	DD-05-01	1	1	X				1					2				X				X	X
Bowan	MR-12-01	1		X				1					2						X	X	P	
Copper	MM-10-01	1	1	X	X			1					2	2		X		X	X		P	
Copper	MC-08-01	1	1	X				1					2				X		X		X	X
Dagger	MR-04-01	1	1	X	X			1	1	2	1	3	2	2	2			X	X	X	P	
Dee Dee, Upper	MR-15-01	1	1	X				1	2	1	2		2				X		X		X	X
Dee Dee/Tamarack, Lower	MR-15-02	1	1	X				1					2	3	3		X		X	X	X	X
Despair, Lower	M-14-01							Fishless													P	
Despair, Upper	M-13-01							Fishless													P	
Diobsud No. 1	LS-01-01	1	1	X				1	1	1	2	2	1	3		X	X		X	X	X	X
Diobsud No. 2, Lower	LS-02-01	1	1	X				1	1	1	2	3	1	3		X			X	X	P	
Diobsud No. 3, Upper	LS-03-01	1	1	X				1					2	3		X			X		P	
Doubtful	CP-01-01	1	1	X	X			1	1	2	3	2	2			X	X	X	X		X	X
Doug's Tarn	M-21-01	2	2	X				1	1	1	2	3	2								P	
East, Lower	MC-14-02		2					Fishless						3			X				X	X
East, Upper	MC-14-01							Fishless									X				X	X
Firn	MP-02-01		2	X				1	1	2	3	3		3	3		X				X	X
Green	M-04-01		2	X				⚑	1	2	2	3									P	
Green Bench	LS-04-01		2	X				Fishless								X	X				X	X
Hanging	MC-08-01							⚑													P	
Hidden	SB-01-01		1	X	X			⚑	3	2	2	3				X		X			P	
Hidden Lake Tarn	EP-14-01		1	X				⚑									X				X	X
Hi-Yu	M-04-01	1	1	X				⚑					2	1			X				X	X
Hozomeen	HM-02-01	1	1	X	X			⚑	1	1	2	2	2			X	X	X	X		X	X
Ipsoot	LS-06-01		1	X			No outlet	1	1	2	2	No outlet		1							P	
Jeanita	DD-01-01	1	1	X	X		No outlet	1	2	1	2	No outlet	2	1		X		X			P	

Lake Information				es	Zooplankton			Vegetation	
Lake Name	**NPS Lake Code**	**TKN (mg/l)**	**Te**	**BMI y**	**NOCA Presence Survey**	**OSU Presence Survey**	**OSU Density Survey**	**Riparian Vegetation**	**Aquatic Vegetation**
Kettling	MR-05-01	2				X	X	P	
Kwahnesum	MC-07-01	2			X			X	X
McAlester	MR-10-01	2			X	X	X	X	X
Middle, Lower	MC-16-02							X	X
Middle, Upper	MC-16-01							P	
Monogram	M-23-01	1			X	X		X	X
Monogram Tarn	M-23-11							P	
Nert	M-05-01	1				X		X	X
Noisy Creek, Upper	LS-14-01							P	
No Name	PM-01-01	2						P	
Panther Potholes, Lower	RD-05-02	1			X	X	X	X	X
Panther Potholes, Upper	RD-05-01	1			X	X	X	X	X
Pegasus	EP-10-01							P	
Pond SE of Kettling Lakes	MR-09-01	2				X	X	X	X
Quill, Lower	M-24-02							P	
Quill, Upper	M-24-01							P	
Rainbow	MR-14-01	2				X	X	X	X
Rainbow, Upper (North)	MR-13-01	1			X	X	X	P	
Rainbow, Upper (South)	MR-13-02	1			X	X	X	P	
Rainbow, Upper (West)	MM-11-01	1				X		P	
Redoubt	MC-11-01	2						X	X
Reveille, Lower	MC-21-02	2				X		X	X
Reveille, Upper	MC-21-01	2				X		X	X
Ridley	HM-03-01	1			X	X		X	X
Sky	EP-13-01							P	
Skymo	PM-03-01	2				X		X	X
Sourdough	PM-12-01							P	
Sourpuss	ML-01-01	1						X	X
Stiletto	MR-01-01	2						X	X
Stout	EP-09-02							P	
Stout, Lower	EP-09-01	2						P	
Sweet Pea	ML-02-01	1			X	X		X	X
Talus Tarn	M-06-01	1						P	
Tapto, Lower	MC-17-03							P	
Tapto, Middle	MC-17-02	1				X	X	P	
Tapto, Upper	MC-17-01	2				X	X	X	X
Tapto, West	MC-17-04	1				X	X	X	X
Thornton, Lower	M-20-01	2				X		X	X
Thornton, Middle	M-19-01	2			X	X		X	X

TABLE F-1: NORTH CASCADES COMPLEX MOUNTAIN LAKES SURVEYS—PROTOCOLS, DATA CATEGORIES, AND RELIABILITY OF DATA (CONTINUED)

Lake Information		Abiotic Data Categories						Biotic Data Categories														
								Fish					Amphibian			Benthic Macroinvertebrates		Zooplankton			Vegetation	
Lake Name	NPS Lake Code	TKN (mg/l)	Surface Water Temperature	Lake Depth	Substrate	Available Spawning Habitat	Outlet Habitat Type	Fish Presence	Fish Reproductive Status	Fish Species Present	Density of Reproducing Fish	Status of Fish Population in Outlet	Snorkel Survey	Visual Survey	Trap Survey	OSU BMI Survey	NOCA BMI Survey	NOCA Presence Survey	OSU Presence Survey	OSU Density Survey	Riparian Vegetation	Aquatic Vegetation
Kettling	MR-05-01	2	2	X				1	1	2	1	3	2	1					X	X	P	
Kwahnesum	MC-07-01	2	1	X	X			1					2	1			X	X			X	X
McAlester	MR-10-01	2	1	X	X			1	1	1	1	1	1	1	1	X	X	X	X	X	X	X
Middle, Lower	MC-16-02		2	X				Fishless						3			X				X	X
Middle, Upper	MC-16-01		2	X				Fishless													P	
Monogram	M-23-01	1	1	X	X			1	1	1	2	3	2	1	3	X	X	X	X		X	X
Monogram Tarn	M-23-11							2						3	3						P	
Nert	M-05-01	1	1	X				2					2	1		X	X		X		X	X
Noisy Creek, Upper	LS-14-01							Fishless													P	
No Name	PM-01-01	2	1	X				1													P	
Panther Potholes, Lower	RD-05-02	1	1	X	X			2					1	1		X	X	X	X	X	X	X
Panther Potholes, Upper	RD-05-01	1	1	X	X			Fishless					1	1		X	X	X	X	X	X	X
Pegasus	EP-10-01							Fishless													P	
Pond SE of Kettling Lakes	MR-09-01	2		X				1					2				X		X	X	X	X
Quill, Lower	M-24-02						No outlet	1	3	2	3	No outlet									P	
Quill, Upper	M-24-01		2	X			No outlet	1	3	2	3	No outlet									P	
Rainbow	MR-14-01	2	1	X				1	1	1	1	3	1			X	X		X	X	X	X
Rainbow, Upper (North)	MR-13-01	1	1	X	X			Fishless					2	1		X		X	X	X	P	
Rainbow, Upper (South)	MR-13-02	1	1	X	X			1					1			X		X	X	X	P	
Rainbow, Upper (West)	MM-11-01	1	1	X				1					2						X		P	
Redoubt	MC-11-01	2	2	X				Fishless					2			X	X				X	X
Reveille, Lower	MC-21-02	2	2	X				Fishless								X	X		X		X	X
Reveille, Upper	MC-21-01	2	1	X				Fishless					2			X	X		X		X	X
Ridley	HM-03-01	1	1	X	X			1					2	1		X	X	X	X		X	X
Sky	EP-13-01							Fishless													P	
Skymo	PM-03-01	2	1	X				1	1	1	2	3	2	2	2	X	X		X		X	X
Sourdough	PM-12-01		2	X				1	1	1	2	3									P	
Sourpuss	ML-01-01	1	1	X				Fishless					2	3			X				X	X
Stiletto	MR-01-01	2	1	X				1									1				X	X
Stout	EP-09-02			X				1	1	1	2	2									P	
Stout, Lower	EP-09-01	2	2	X				1	1	1	2	3	2								P	
Sweet Pea	ML-02-01	1	1	X	X			1					2	3	3		X	X	X		X	X
Talus Tarn	M-06-01	1	1	X				Fishless					2	3		X					P	
Tapto, Lower	MC-17-03							Fishless													P	
Tapto, Middle	MC-17-02	1	1	X				Fishless								X			X	X	P	
Tapto, Upper	MC-17-01	2		X				Fishless								X	X		X	X	X	X
Tapto, West	MC-17-04	1	2	X				Fishless								X	X		X	X	X	X
Thornton, Lower	M-20-01	2	1	X				1	3	3	3	3	2	1			X		X		X	X
Thornton, Middle	M-19-01	2	1	X	X			1					2				X	X	X		X	X

Lake Information				s	Zooplankton			Vegetation	
Lake Name	NPS Lake Code	TKN (mg/l)	Ter	MI y	NOCA Presence Survey	OSU Presence Survey	OSU Density Survey	Riparian Vegetation	Aquatic Vegetation
Thunder	RD-02-01	1			X	X		X	X
Tiny	MC-15-01							X	X
Torment	ML-03-01	2			X			P	
Trapper	GM-01-01	1			X	X		P	
Triplet, Lower	SM-02-01	1				X	X	X	X
Triplet, Upper	SM-02-02	2				X	X	X	X
Triumph	M-17-01							P	
Unnamed	FP-01-01							P	
Unnamed	MR-11-01	1			X	X	X	X	X
Unnamed	MR-16-01	2				X	X	P	
Vulcan	ML-04-01	1				X		X	X
Wilcox/Lillie, Upper	EP-06-01	1				X		P	
Wilcox/Sandie, Lower	EP-05-01	2						X	X
Wild	MC-27-01	1				X		P	
Willow	HM-04-01	1			X	X		X	X

Notes:

a. The presence/absence of data and its reliability are pres art of the proposed monitoring plan.

Cells marked by an "X" indicate that a reliable survey has b

Data Categories:

TKN (mg/l): Total Kjeldahl nitrogen determined using OSU

1 = High confidence in number because surveys on r

2 = Low confidence in number because surveys were

Surface Water Temperature: Surface water taken during t

1 = High confidence in number because surveys were

2 = Low confidence in number because surveys were

Lake Depth: Lake depth measured in feet at deepest portic

Substrate (percentage by type: silt, sand, gravel, cobble, c rcentages by type are totaled.

Available Spawning Habitat (spawning area and type of s measured stream areas. If available beach spawning habitat needs to be determined, gravel areas can be measured by snorke

Outlet Habitat Type (surface, subsurface, none): Outlet su e information is if a lake does or does not have an outlet.

Fish Presence: Fish presence is measured by setting funn be gathered after a fish removal treatment, young of the year are the target of surveys. Visual observation and trapping are likely

Fishless = Lake is currently fishless. This information

1 = High confidence that fish are present in lake beca

2 = Low confidence in presence of fish because of la

Fish Reproductive Status (by species/subspecies/hatcher ng years when documented stocking is not known to have occurred.

1 = Lakes with known reproduction at adequate levels

2 = Lakes where limited levels of reproduction are kn

3 = Lakes where limited levels of reproduction are th

Fish Species Present (species/subspecies/hatchery stock n is available.

1 = Fish species/strain/hatchery stock is well docume

2 = Fish species/subspecies/strain is not fully docum

3 = Species of fish that is reproducing is not known.

Table F-1: North Cascades Complex Mountain Lakes Surveys—Protocols, Data Categories, and Reliability of Data (continued)

Lake Information		Abiotic Data Categories						Biotic Data Categories														
								Fish					Amphibian			Benthic Macroinvertebrates		Zooplankton			Vegetation	
Lake Name	NPS Lake Code	TKN (mg/l)	Surface Water Temperature	Lake Depth	Substrate	Available Spawning Habitat	Outlet Habitat Type	Fish Presence	Fish Reproductive Status	Fish Species Present	Density of Reproducing Fish	Status of Fish Population in Outlet	Snorkel Survey	Visual Survey	Trap Survey	OSU BMI Survey	NOCA BMI Survey	NOCA Presence Survey	OSU Presence Survey	OSU Density Survey	Riparian Vegetation	Aquatic Vegetation
Thunder	RD-02-01	1	1	X	X			Fishless					2	3	1	X	X	X	X		X	X
Tiny	MC-15-01		2	X				Fishless						3			X				X	X
Torment	ML-03-01	2	1	X	X			1					2	3				X			P	
Trapper	GM-01-01	1	1	X	X			1	1	2	2	2	2			X		X	X		P	
Triplet, Lower	SM-02-01	1	2	X				1	1	1	1	3	2	3		X	X		X	X	X	X
Triplet, Upper	SM-02-02	2	2	X				1	1	1	1	3	2	3		X	X		X	X	X	X
Triumph	M-17-01		2	X				1						1		X					P	
Unnamed	FP-01-01							Fishless													P	
Unnamed	MR-11-01	1	1	X	X			1					2	3	1	X	X	X	X	X	X	X
Unnamed	MR-16-01	2		X				2	3	2	1	3	2						X	X	P	
Vulcan	ML-04-01	1	1	X				Fishless					2	3	3	X	X		X		X	X
Wilcox/Lillie, Upper	EP-06-01	1	1	X				1	1	1	3	2				X			X		P	
Wilcox/Sandie, Lower	EP-05-01	2	1	X				1	1	1	3	3	2				X				X	X
Wild	MC-27-01	1	1	X				Fishless					2			X			X		P	
Willow	HM-04-01	1	1	X	X			1					2	2		X	X	X	X		X	X

Notes:

a. The presence/absence of data and its reliability are presented as a "snapshot" of the data available in April 2004. Additional lake surveys may have been performed, and conditions may change prior to baseline surveys conducted as part of the proposed monitoring plan.

Cells marked by an "X" indicate that a reliable survey has been conducted; blank cells indicate that no survey has been conducted.

Data Categories:

TKN (mg/l): Total Kjeldahl nitrogen determined using OSU protocols for collecting water samples in the field.

1 = High confidence in number because surveys on multiple dates were conducted, the mean has a low standard deviation, or few outliers were present.
2 = Low confidence in number because surveys were only conducted on one date, the mean had a high standard deviation, or two or more values were both higher and lower than 0.045 mg/l.

Surface Water Temperature: Surface water taken during thermal maxima (warmest period of day) over deepest portion of lake using OSU Protocols

1 = High confidence in number because surveys were conducted on multiple dates, the mean has a low standard deviation, or few outliers were present.
2 = Low confidence in number because surveys were only conducted on one date, the mean had a high standard deviation, or the range of values was unusually high.

Lake Depth: Lake depth measured in feet at deepest portion of lake, depth is usually measured with a weighted line, but can be measured with electronic depth finders. Reliable measurements exist for most lakes.

Substrate (percentage by type: silt, sand, gravel, cobble, coarse woody debris, etc.): Percentage of substrate types is visually estimated for individual measured segments of shoreline during a survey of perimeter of lakeshore, and the percentages by type are totaled.

Available Spawning Habitat (spawning area and type of spawning habitat): No spawning habitat surveys have been conducted. The percentage of available (accessible) spawning gravel in inlet and outlet streams is visually estimated for measured stream areas. If available beach spawning habitat needs to be determined, gravel areas can be measured by snorkel surveys in areas where upwelling through gravel is measured or assumed.

Outlet Habitat Type (surface, subsurface, none): Outlet surveyed in field to determine if a surface connection exists part of the season so that fish can physically migrate out from a lake into downstream basin. Currently, the only available information is if a lake does or does not have an outlet.

Fish Presence: Fish presence is measured by setting funnel traps, visual observation of shallow areas of lake (by wading or snorkeling), observation of surface feeding activity, hook-and-line fishing, or gillnets. Since this information is to be gathered after a fish removal treatment, young of the year are the target of surveys. Visual observation and trapping are likely to be the most successful methods of surveying.

Fishless = Lake is currently fishless. This information has been determined by either survey or historic information (no reports of observed fish or lake with no recorded reproduction and has not been stocked in over 10 years).
1 = High confidence that fish are present in lake because (1) reproduction well documented, (2) lake has been recently stocked, or (3) recent reports exist of fish observed or caught.
2 = Low confidence in presence of fish because of lack of confidence in available records.

Fish Reproductive Status (by species/subspecies/hatchery stock): Fish have continued to persist in multiple year classes with no documented stocking occurring. Fish have been observed spawning, and fry have been documented during years when documented stocking is not known to have occurred.

1 = Lakes with known reproduction at adequate levels to sustain population.
2 = Lakes where limited levels of reproduction are known to occur.
3 = Lakes where limited levels of reproduction are thought to occur.

Fish Species Present (species/subspecies/hatchery stock): Fish species have been determined through historic records of stocking and examination of catch records. In one case (McAlester Lake), a genetic analysis of the fish population is available.

1 = Fish species/strain/hatchery stock is well documented.
2 = Fish species/subspecies/strain is not fully documented or level of introgression is suspected.
3 = Species of fish that is reproducing is not known.

Density of Reproducing Fish: The only reliable estimate

1 = Density of reproducing fish population has been

2 = Density of reproducing fish has not been quantif

3 = Density of reproducing fish has not been docum

Status of Fish Population in Outlet: The outlet stream o producing populations of trout should be surveyed by visual means (assessment of availability of suitable habitat and visual si duced fish above and below the upstream maximum extent of native fish.

1 = Outlet has been surveyed for presence and type

2 = Outlet has not been surveyed, but some evidenc

3 = Outlet has not been surveyed.

No outlet; No surface outlet is known to exist.

Amphibian Snorkel Survey: OSU protocol was used to d

1 = High confidence in data because more than 2 su

2 = Moderate confidence in data because 1–2 surve

Amphibian Visual Survey: Visual surveys of amphibians here identification is questionable, individuals are captured by hand or dipnet and voucher specimens collected if necessary.

1 = High confidence in presence because amphibiar

2 = Moderate confidence in presence data because

3 = Low confidence in presence data because only c

Amphibian Trapping Survey: Trapping surveys conducte level of detection available from a snorkel survey. No mark-and-recapture surveys were conducted, so densities were not d

1 = High confidence in presence because amphibiar

2 = Moderate confidence in presence data because

3 = Low confidence in presence data because only c

OSU Benthic Macroinvertebrate Survey: Survey used O

NOCA Benthic Macroinvertebrate Survey: Survey used rotocols. In addition, habitat data (substrate, riparian vegetation, and aquatic vegetation) were collected.

NOCA Zooplankton Presence Survey (to document the p

OSU Zooplankton Presence Survey (to document the pr ampled, but proportions of taxa were measured to determine dominant/subdominant taxa. Reliability of presence data is

OSU Zooplankton Density Survey (to document the pres proximate zooplankton densities by species.

Riparian Vegetation: Percentage of riparian vegetation by etation type was calculated from this data. Cells marked with an "X" indicate that a survey was performed. Cells marked with a

Aquatic Vegetation: The percentage of shoreline with aqu tion was calculated from this data.

Density of Reproducing Fish: The only reliable estimates are from mark-and-recapture studies conducted by OSU.

1 = Density of reproducing fish population has been documented through mark-and-recapture study (OSU protocols).
2 = Density of reproducing fish has not been quantified but estimated based on subjective data and best professional judgment.
3 = Density of reproducing fish has not been documented, and no data other than presence and a general idea of species is available.

Status of Fish Population in Outlet: The outlet stream of McAlester Lake is the only stream where an assessment of downstream migration of trout introduced into mountain lakes has been documented. Outlet streams of lakes with reproducing populations of trout should be surveyed by visual means (assessment of availability of suitable habitat and visual signs of trout) to determine where fish occur. Backpack electrofishers should be used to confirm the upstream extent of native fish (usually at a barrier falls) and the presence of introduced fish above and below the upstream maximum extent of native fish

1 = Outlet has been surveyed for presence and type of fish downstream to native fish populations.
2 = Outlet has not been surveyed, but some evidence of downstream migration and colonization is available.
3 = Outlet has not been surveyed.
No outlet; No surface outlet is known to exist.

Amphibian Snorkel Survey: OSU protocol was used to determine salamander nearshore population densities by conducting nearshore snorkel transects of randomly selected 100-meter segments of lake shorelines.

1 = High confidence in data because more than 2 surveys were conducted.
2 = Moderate confidence in data because 1–2 surveys were conducted. The probability of detection of populations was still good, but density data may reflect low recruitment years (weather and other causes).

Amphibian Visual Survey: Visual surveys of amphibians conducted utilizing methodologies outlined in Olson et al. 1997. Surveys are not quantitative (number/time, area, or distance). Amphibians usually identified without capture, but where identification is questionable, individuals are captured by hand or dipnet and voucher specimens collected if necessary.

1 = High confidence in presence because amphibians were observed.
2 = Moderate confidence in presence data because more than one survey was conducted.
3 = Low confidence in presence data because only one survey was conducted.

Amphibian Trapping Survey: Trapping surveys conducted with funnel traps utilizing methodologies outlined in Olson et al. 1997. Some surveys were quantitative (number/time), but it is unlikely that enough traps were set to achieve the level of detection available from a snorkel survey. No mark-and-recapture surveys were conducted, so densities were not determined.

1 = High confidence in presence because amphibians were observed.
2 = Moderate confidence in presence data because more than one survey was conducted.
3 = Low confidence in presence data because only one survey was conducted.

OSU Benthic Macroinvertebrate Survey: Survey used OSU sampling protocols. BMI were collected with kicknets. No habitat data (substrate, riparian vegetation, and aquatic vegetation) were collected.

NOCA Benthic Macroinvertebrate Survey: Survey used NOCA sampling protocols. More intensive sampling of BMI occurred using kicknets for sampling. This protocol is more likely to detect presence of all species present than OSU protocols. In addition, habitat data (substrate, riparian vegetation, and aquatic vegetation) were collected.

NOCA Zooplankton Presence Survey (to document the presence of large copepod species): Surveys used vertical net tows, but information has not been quantified and methodology or equipment documented.

OSU Zooplankton Presence Survey (to document the presence of large copepod species): Surveys used OSU protocol for vertical (deeper lakes) or horizontal (shallow lakes) net tows. Samples were not quantified by volume of water sampled, but proportions of taxa were measured to determine dominant/subdominant taxa. Reliability of presence data is good, but sparse populations may not be documented.

OSU Zooplankton Density Survey (to document the presence and density of large copepod species): Surveys used OSU protocol in vertical or horizontal net tows. Data were quantified by determining the volume of water sampled to approximate zooplankton densities by species.

Riparian Vegetation: Percentage of riparian vegetation by type (shrub, forest, talus, forbes) was visually estimated for measured segments of shoreline during surveys of lake perimeters. The total breakdown by percentage for each vegetation type was calculated from this data. Cells marked with an "X" indicate that a survey was performed. Cells marked with a "P" indicate that this information has been approximated through aerial photo interpretation.

Aquatic Vegetation: The percentage of shoreline with aquatic vegetation present has been visually estimated for measured segments of shoreline during a survey of lake perimeters. The total percentage of shoreline with aquatic vegetation was calculated from this data.

Management actions for each of the four categories of lakes are described in table F-2. Management actions and their associated monitoring requirements would differ for many lakes according to the action alternative (B, C, or D) chosen. A list of all 91 lakes and their management actions under each alternative are shown in table F-3. Under alternative B, up to 42 lakes may be available for fishing; under alternative C, up to 11 lakes may be available for fishing; and under alternative D, all 91 lakes would either remain fishless or be returned to a fishless condition. Under the no-action alternative (alternative A), current lake management practices would continue.

For each management action, the monitoring actions and objectives would remain the same, regardless of the alternative chosen, such as under management action 2A—remove all reproducing fish. Monitoring the recovery of native organisms and maintaining the lake in a fishless state would be the same under alternatives B and C. Under management action 2A, four monitoring actions are indicated:

> Monitor effects of chemical fish removal on nontarget organisms (if applicable)
>
> Monitor effectiveness of fish removal or die off (if applicable)
>
> Monitor recovery of indicators after fish removal or die off (never restock)
>
> Monitor riparian vegetation impacts/recovery (if present)

These monitoring actions are the same for all lakes that fall under management action 2A.

The various management actions and their monitoring requirements and objectives are listed in table F-4. Monitoring actions are shown in the main body of the table, and the monitoring objectives are described in footnotes. The process for deciding what monitoring should be performed is illustrated in the monitoring flowchart (figure F-1).

KEY DATA CATEGORIES AND SELECTION OF METHODS/PROTOCOLS FOR MONITORING

Key data are needed in order to determine into what category to place each lake and to monitor the effects of the various management actions. These data include such parameters as presence/absence of fish, density of fish, fish reproductive status, zooplankton species and abundance, benthic (bottom dwelling) macroinvertebrate community composition, lake productivity, lake depth, and lake location relative to the Cascade Crest (west or east side). Data already collected or needed to be collected are separated into abiotic (physical and chemical) and biotic (fish, amphibians) categories. Within each of these categories, data are further identified as either *key data* or *additional data* that may be useful but are not critical to monitoring the management actions.

TABLE F-2: MANAGEMENT ACTIONS FOR THE 91 LAKES

	This table presents a standard set of fishery management actions for implementation under alternatives B and C. Note that management actions under alternative A would not change from current management, and management actions under alternative D only involve discontinuing stocking and removing all fish. The standard management actions in this table are broken down into classes 1-4, based on the Technical Advisory Committee's current understanding of the presence, reproductive status, and density of fish in the lakes. These standard management actions would require periodic monitoring and evaluation to facilitate adaptive management.
	For a lake that is currently fishless:
1	The lake would remain fishless.
	For a lake with high densities of reproducing fish, apply one of the following management actions:
2A	Remove all reproducing fish. Monitor the recovery of native organisms and keep the lake fishless.
2B	Remove all reproducing fish. Monitor lake conditions and use the results to determine whether or not to restock the lake with nonreproducing fish. If the lake is restocked and monitoring results indicate fish are causing major adverse impacts, then fish densities would be reduced by changing stocking densities, stocking cycles or the species of stocked fish. If these management changes do not work, then discontinue stocking.
2C	Remove all reproducing fish. Implement a resting period (that is, keep the lake fishless for a period of time) to foster recovery of native organisms, The duration of the resting period will be determined on a lake-by-lake basis based upon monitoring results. If monitoring results indicate favorable recovery of native organisms, then restock the lake with low densities of nonreproducing fish and monitor lake conditions. If monitoring results indicate fish are causing major adverse impacts, then reduce stocking densities, stocking cycles, or the species of stocked fish. If these management changes do not work, then discontinue stocking.
	For a lake with low densities of reproducing fish, apply one of the following management actions:
3A	Remove all reproducing fish. Monitor the recovery of native organisms, and keep the lake fishless.
3B	Evaluate the reproductive status of fish and the status of indicator taxa. If fish density is high enough that impacts on indicator taxa may be major, apply prescription 2A, 2B, or 2C. If fish densities and impacts to indicator taxa are low, maintain the low fish densities. If monitoring data indicate fish are causing major adverse impacts, then completely remove fish.
3C	For lakes with extremely low densities of fish, augment the population with supplemental stocking and monitor indicator taxa. If monitoring results indicate fish are causing major adverse impacts, then stop stocking and remove all fish.
	For a lake that has been stocked and does not contain a reproducing population of fish, apply one of the following management actions:
4A	Discontinue stocking. Monitor the recovery of native organisms.
4B	Lack of data for decision-making. Discontinue stocking and monitor lake conditions. If the lake is restocked and monitoring results indicate fish are causing major adverse impacts, then discontinue stocking.
4C	Continue stocking with low densities of fish expected not to reproduce in the lake. If monitoring results indicate fish are causing major adverse impacts, then reduce stocking densities, stocking cycles or the species of stocked fish. If these management changes do not work, then discontinue stocking.

TABLE F-3: MANAGEMENT ACTION FOR EACH OF THE 91 LAKES

Note: Shaded rows indicate lakes that are in Ross Lake and Lake Chelan National Recreation Areas; the other lakes are in the national park portion of the North Cascades Complex.

Lake Name	NPS Lake Code	Current Condition of Lake (as represented under alternative A)	Management Action		
			Alternative B	Alternative C	Alternative D
Azure	MP-09-01	Fishless	1	1	1
Battalion	MLY-02-01	High density reproducing fish	2B	2B	2A
Bear	MC-12-1	High density reproducing fish	2C	2A	2A
Berdeen	M-08-01	High density reproducing fish	2C	2A	2A
Berdeen, Lower	M-07-01	High density reproducing fish	2A	2A	2A
Berdeen, Upper	M-09-01	High density reproducing fish	2A	2A	2A
Blum (Largest/Middle, No. 3)	M-11-01	High density reproducing fish	2B	2A	2A
Blum (Lower/West, No. 4)	LS-07-01	High density reproducing fish	2C	2A	2A
Blum (Small/North, No. 2)	MC-01-01	Fishless	1	1	1
Blum (Vista/Northwest, No. 1)	MC-02-01	Fishless	1	1	1
Bouck, Lower	DD-04-01	High density reproducing fish	2C	2C	2A
Bouck, Upper	DD-05-01	Stocked with nonreproducing fish	4A	4A	4A
Bowan	MR-12-01	Stocked with nonreproducing fish	4A	4A	4A
Coon	MM-10-01	Stocked with nonreproducing fish	4C	4C	4A
Copper[a]	MC-06-01	Stocked with nonreproducing fish	4B	4A	4A
Dagger	MR-04-01	High density reproducing fish	2B	2A	2A
Dee Dee, Upper	MR-15-01	High density reproducing fish	2B	2A	2A
Dee Dee/Tamarack, Lower	MR-15-02	Stocked with nonreproducing fish	4A	4A	4A
Despair, Lower	M-14-01	Fishless	1	1	1
Despair, Upper	M-13-01	Fishless	1	1	1
Diobsud No. 1	LS-01-01	High density reproducing fish	2A	2A	2A
Diobsud No. 2, Lower	LS-02-01	High density reproducing fish	2B	2A	2A
Diobsud No. 3, Upper	LS-03-01	Stocked with nonreproducing fish	4A	4A	4A
Doubtful	CP-01-01	High density reproducing fish	2C	2A	2A
Doug's Tarn	M-21-01	High density reproducing fish	2C	2A	2A
East, Lower	MC-14-02	Fishless	1	1	1
East, Upper	MC-14-01	Fishless	1	1	1
Firn	MP-02-01	Low density reproducing fish	3B	3A	3A
Green	M-04-01	High density reproducing fish	2B	2A	2A
Green Bench	LS-04-01	Fishless	1	1	1
Hanging	MC-08-01	High density reproducing fish	2A[b]	2A[b]	2A[b]
Hidden	SB-01-01	Low density reproducing fish	3C	3A	3A
Hidden Lake Tarn	EP-14-01	Stocked with nonreproducing fish	4A	4A	4A
Hi-Yu	M-01-01	Stocked with nonreproducing fish	4B	4A	4A
Hozomeen	HM-02-01	High density reproducing fish	2A	2A	2A
Ipsoot	LS-06-01	Low density reproducing fish	3B	3A	3A
Jeanita	DD-01-01	Low density reproducing fish	3B	3A	3A
Kettling	MR-05-01	High density reproducing fish	2A	2A	2A
Kwahnesum	MC-07-01	Stocked with nonreproducing fish	4A	4A	4A
McAlester	MR-10-01	High density reproducing fish	2B	2B	2A
Middle, Lower	MC-16-02	Fishless	1	1	1
Middle, Upper	MC-16-01	Fishless	1	1	1
Monogram	M-23-01	High density reproducing fish	2C	2A	2A
Monogram Tarn	M-23-11	Stocked with nonreproducing fish	4A	4A	4A
Nert	M-05-01	Stocked with nonreproducing fish	4A	4A	4A
Noisy Creek, Upper	LS-14-01	Fishless	1	1	1
No Name	PM-01-01	Stocked with nonreproducing fish	4C	4A	4A

TABLE F-3: MANAGEMENT ACTION FOR EACH OF THE 91 LAKES (CONTINUED)

Lake Name	NPS Lake Code	Current Condition of Lake (as represented under Alternative A)	Management Action		
			Alternative B	Alternative C	Alternative D
Panther Potholes, Lower	RD-05-02	Stocked with nonreproducing fish	4A	4A	4A
Panther Potholes, Upper	RD-05-01	Fishless	1	1	1
Pegasus	EP-10-01	Fishless	1	1	1
Pond SE of Kettling Lakes	MR-09-01	Stocked with nonreproducing fish	4C	4C	4A
Quill, Lower	M-24-02	Stocked with nonreproducing fish	4B	4A	4A
Quill, Upper	M-24-01	Stocked with nonreproducing fish	4B	4A	4A
Rainbow	MR-14-01	High density reproducing fish	2C	2C	2A
Rainbow, Upper (North)	MR-13-01	Fishless	1	1	1
Rainbow, Upper (South)	MR-13-02	Stocked with nonreproducing fish	4A	4A	4A
Rainbow, Upper (West)	MM-11-01	Stocked with nonreproducing fish	4A	4A	4A
Redoubt	MC-11-01	Fishless	1	1	1
Reveille, Lower	MC-21-02	Fishless	1	1	1
Reveille, Upper	MC-21-01	Fishless	1	1	1
Ridley	HM-03-01	Stocked with nonreproducing fish	4C	4C	4A
Sky	EP-13-01	Fishless	1	1	1
Skymo	PM-03-01	High density reproducing fish	2C	2A	2A
Sourdough	PM-12-01	High density reproducing fish	2B	2A	2A
Sourpuss	ML-01-01	Fishless	1	1	1
Stiletto	MR-01-01	Stocked with nonreproducing fish	4B	4A	4A
Stout	EP-09-02	Low density reproducing fish	3B	3A	3A
Stout, Lower	EP-09-01	Low density reproducing fish	3B	3A	3A
Sweet Pea	ML-02-01	Stocked with nonreproducing fish	4C	4A	4A
Talus Tarn	M-06-01	Fishless	1	1	1
Tapto, Lower	MC-17-03	Fishless	1	1	1
Tapto, Middle	MC-17-02	Fishless	1	1	1
Tapto, Upper	MC-17-01	Fishless	1	1	1
Tapto, West	MC-17-04	Fishless	1	1	1
Thornton, Lower	M-20-01	Low density reproducing fish	3C	3A	3A
Thornton, Middle	M-19-01	Stocked with nonreproducing fish	4C	4A	4A
Thunder	RD-02-01	Fishless	1	1	1
Tiny	MC-15-01	Fishless	1	1	1
Torment	ML-03-01	Stocked with nonreproducing fish	4A	4A	4A
Trapper	GM-01-01	Low density reproducing fish	3B	3A	3A
Triplet, Lower	SM-02-01	High density reproducing fish	2C	2C	2A
Triplet, Upper	SM-02-02	High density reproducing fish	2A	2A	2A
Triumph	M-17-01	Stocked with nonreproducing fish	4C	4A	4A
Unnamed	FP-01-01	Fishless	1	1	1
Unnamed	MR-11-01	Stocked with nonreproducing fish	4C	4C	4A
Unnamed	MR-16-01	Low density reproducing fish	3B	3B	3A
Vulcan	ML-04-01	Fishless	1	1	1
Wilcox/Lillie, Upper	EP-06-01	High density reproducing fish	2A	2A	2A
Wilcox/Sandie, Lower	EP-05-01	High density reproducing fish	2C	2A	2A
Wild	MC-27-01	Fishless	1	1	1
Willow	HM-04-01	Stocked with nonreproducing fish	4C	4C	4A

Notes:

a. In August 2004, a large fish kill was observed in Copper Lake, possibly due to disease. Further surveys are needed to confirm that the lake is fishless.

b. Remove all reproducing fish pending agreement with British Columbia.

Monitoring Objectives: (see below for descriptions)		(8)	(9)
Monitoring Actions: Management Actions (a)	Perfor Meas	Improve Knowledge of Recreational Fishing Levels	Survey Riparian Vegetation Impacts/Recovery (if present) (2)
Lakes that are Currently Fishless			
1 (Lakes to remain fishless) [29,29]	X[d] (for se		
Lakes with High Densities of Reproducing Fish			
2A (Treat lakes to remove high-density reproducing fish) [8,22]	X (as		X
2B (Remove reproducing fish, gather information, determine if lake should be restocked) [8,2]	X (as	X	X
2C (Remove reproducing fish, allow lake to rest, restock with nonreproducing fish) [11,3]	X (as	X	X
Lakes with Low Densities of Reproducing Fish			
3A (Treat lakes to remove low density reproducing fish) [0,8]	X (as		X
3B (Evaluate reproductive status of fish, allow low densities of fish) [7,1]	X (as	X	X
3C (Supplement low densities of reproducing fish with stocked nonreproducing fish) [2,0]	X (as	X	X
Lakes with Nonreproducing Fish			
4A (Discontinue stocking of lake [nonreproducing fish]) [12,21]	X (as		X
4B (Discontinue stocking of lake, gather information, determine if lake should be restocked) [5,0]	X (as	X	X
4C (Continue to stock with nonreproducing fish) [9,5]	X (as	X	X

Notes:

a. See table F-2 for full descriptions of the management actic

b. If needed as input to adaptive management decisions.

c. If unacceptable effects occur, a different management acti

d. X = possible monitoring could occur for each managemen

MONITORING OBJECTIVES:

1. To supplement existing data with key biological and physic
2. To evaluate the degree of adverse impact of antimycin on
3. To determine the effectiveness of fish removal and to eval
4. In lakes that would be maintained as fishless, to determinsions.
5. Prior to any restocking, use the data to determine whether
6. To determine the impacts of nonnative fish on the native b
7. To improve knowledge of recreational fishing activity. To u
8. To determine fish population characteristics. Data would sucing fish.
9. If riparian-zone vegetation is present along shoreline, dete

TABLE F-4: MANAGEMENT ACTIONS AND MONITORING OBJECTIVES

Monitoring Objectives: (see below for descriptions)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Monitoring Actions: Management Actions (a)	Perform Baseline Measurements	Monitor Effects of Chemical Fish Removal on Nontarget Organisms (if applicable)	Monitor Effectiveness of Fish Removal or Die Off (if applicable)	Monitor Recovery of Indicators After Fish Removal or Die Off (never restock) (b)	Monitor Indicators to Determine Restocking After Fish Removal or Die Off	Monitor Effects of (Re)Stocked Fish on Indicators (c)	Determine Characteristics of Fish Population	Improve Knowledge of Recreational Fishing Levels	Survey Riparian Vegetation Impacts/Recovery (if present) (2)
Lakes that are Currently Fishless									
1 (Lakes to remain fishless) [29,29]	X[d] (for selected lakes)								
Lakes with High Densities of Reproducing Fish									
2A (Treat lakes to remove high-density reproducing fish) [8,22]	X (as needed)	X	X	X					X
2B (Remove reproducing fish, gather information, determine if lake should be restocked) [8,2]	X (as needed)	X	X		X	X	X	X	X
2C (Remove reproducing fish, allow lake to rest, restock with nonreproducing fish) [11,3]	X (as needed)	X	X			X	X	X	X
Lakes with Low Densities of Reproducing Fish									
3A (Treat lakes to remove low density reproducing fish) [0,8]	X (as needed)	X	X	X					X
3B (Evaluate reproductive status of fish, allow low densities of fish) [7,1]	X (as needed)	X (if needed)	X (if needed)			X	X	X	X
3C (Supplement low densities of reproducing fish with stocked nonreproducing fish) [2,0]	X (as needed)	X (if needed)	X (if needed)			X	X	X	X
Lakes with Nonreproducing Fish									
4A (Discontinue stocking of lake [nonreproducing fish]) [12,21]	X (as needed)		X	X					X
4B (Discontinue stocking of lake, gather information, determine if lake should be restocked) [5,0]	X (as needed)	X (if needed)	X (if needed)		X	X	X	X	X
4C (Continue to stock with nonreproducing fish) [9,5]	X (as needed)	X (if needed)	X (if needed)			X	X	X	X

Notes:

a. See table F-2 for full descriptions of the management actions. Numbers in brackets [B,C] are estimated numbers of lakes within each management action under alternatives B and C (see table F-3).

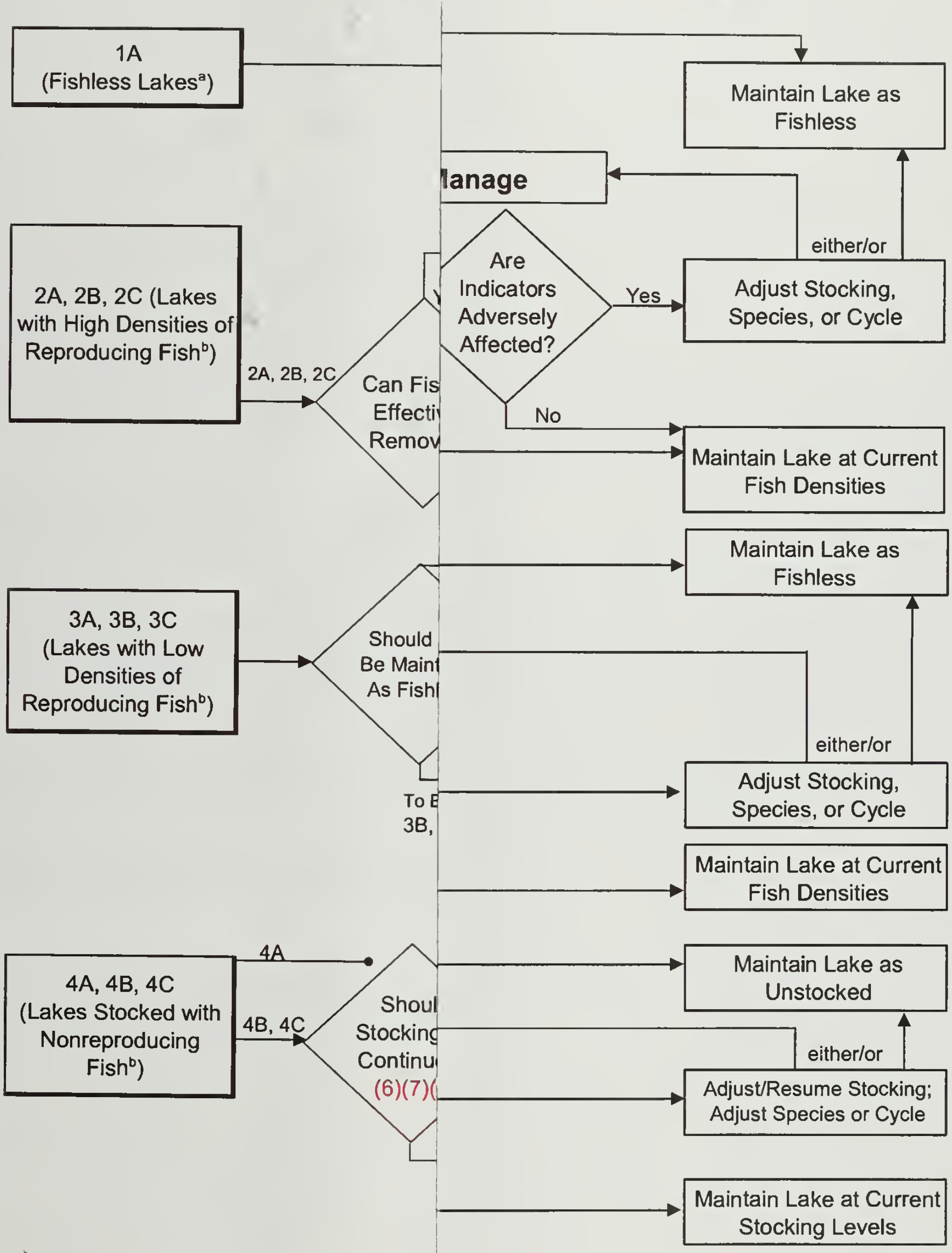
b. If needed as input to adaptive management decisions.

c. If unacceptable effects occur, a different management action (e.g., fish removal) would be applied.

d. X = possible monitoring could occur for each management action.

MONITORING OBJECTIVES:

1. To supplement existing data with key biological and physical/chemical data as needed for use as baseline in the monitoring program.
2. To evaluate the degree of adverse impact of antimycin on native biota in order to minimize impacts of future antimycin applications.
3. To determine the effectiveness of fish removal and to evaluate if all fish (reproducing or nonreproducing) have been eliminated or if population levels have been reduced, and if additional/different fish removal should be performed.
4. In lakes that would be maintained as fishless, to determine recovery of indicators after fish removal or die-off — never restock. Use the monitoring data as input for possible adjustments to thresholds or future adaptive management decisions.
5. Prior to any restocking, use the data to determine whether indicators are satisfactorily recovering to permit restocking at an appropriate level. Use the data as input to adaptive management decisions.
6. To determine the impacts of nonnative fish on the native biota. Use the data as input to future adaptive management decisions.
7. To improve knowledge of recreational fishing activity. To understand relative demand for fishing and focus mitigation measures where needed.
8. To determine fish population characteristics. Data would serve as one indicator of the biological condition of the lake and as an indicator of recreational fishing opportunities/experience and the need for stocking/restocking with nonreproducing fish.
9. If riparian-zone vegetation is present along shoreline, determine the impacts of trampling of vegetation by anglers. Data on degree of trampling and recovery would be used as input to management decisions.


1A
(Fishless Lakes[a])
Maintain Lake as Fishless
lanage
Are Indicators Adversely Affected?
Yes
No
either/or
Adjust Stocking, Species, or Cycle
2A, 2B, 2C (Lakes with High Densities of Reproducing Fish[b])
2A, 2B, 2C
Can Fis
Effecti
Remov
Maintain Lake at Current Fish Densities
Maintain Lake as Fishless
3A, 3B, 3C
(Lakes with Low Densities of Reproducing Fish[b])
Should
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As Fish
either/or
Adjust Stocking, Species, or Cycle
To E
3B,
Maintain Lake at Current Fish Densities
4A
4A, 4B, 4C
(Lakes Stocked with Nonreproducing Fish[b])
4B, 4C
Shoul
Stocking
Continu
(6)(7)(
Maintain Lake as Unstocked
either/or
Adjust/Resume Stocking; Adjust Species or Cycle
Maintain Lake at Current Stocking Levels

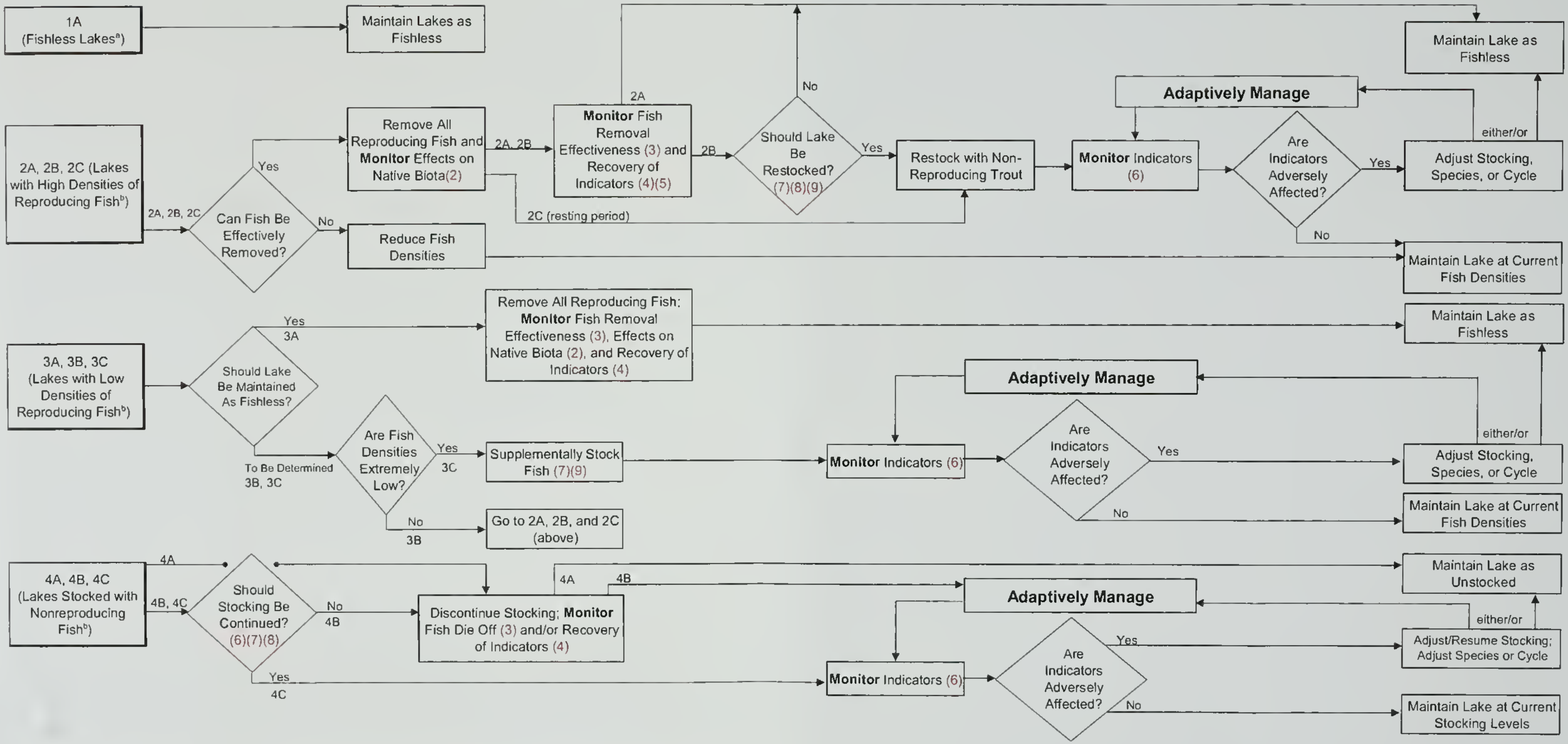
NOTES:

a. Selected lakes may be surveyed for bas

b. It is assumed that these lakes have adeq
the missing/inadequate key data sets wo
and in "Table F-4: Management Actions a

Red numbers (1, 2, 3, 4, 5, 6, 7, 8, 9) ind

FIGURE F-1: MOUNTAIN LAKES FISHERY MANAGEMENT MONITORING FLOW CHART


1A (Fishless Lakes^a)
Maintain Lakes as Fishless
2A, 2B, 2C (Lakes with High Densities of Reproducing Fish^b)
2A, 2B, 2C
Can Fish Be Effectively Removed?
Yes
No
Remove All Reproducing Fish and Monitor Effects on Native Biota(2)
Reduce Fish Densities
2A, 2B
Monitor Fish Removal Effectiveness (3) and Recovery of Indicators (4)(5)
2A
2B
2C (resting period)
Should Lake Be Restocked? (7)(8)(9)
No
Yes
Restock with Non-Reproducing Trout
Monitor Indicators (6)
Adaptively Manage
Are Indicators Adversely Affected?
Yes
No
Adjust Stocking, Species, or Cycle
either/or
Maintain Lake as Fishless
Maintain Lake at Current Fish Densities
3A, 3B, 3C (Lakes with Low Densities of Reproducing Fish^b)
Should Lake Be Maintained As Fishless?
Yes
3A
Remove All Reproducing Fish; Monitor Fish Removal Effectiveness (3), Effects on Native Biota (2), and Recovery of Indicators (4)
Maintain Lake as Fishless
To Be Determined
3B, 3C
Are Fish Densities Extremely Low?
Yes
3C
Supplementally Stock Fish (7)(9)
No
3B
Go to 2A, 2B, and 2C (above)
Adaptively Manage
Monitor Indicators (6)
Are Indicators Adversely Affected?
Yes
No
Adjust Stocking, Species, or Cycle
either/or
Maintain Lake at Current Fish Densities
4A, 4B, 4C (Lakes Stocked with Nonreproducing Fish^b)
4A
4B, 4C
Should Stocking Be Continued? (6)(7)(8)
No
4B
Yes
4C
Discontinue Stocking; Monitor Fish Die Off (3) and/or Recovery of Indicators (4)
4A
4B
Maintain Lake as Unstocked
Adaptively Manage
Monitor Indicators (6)
Are Indicators Adversely Affected?
Yes
No
either/or
Adjust/Resume Stocking; Adjust Species or Cycle
Maintain Lake at Current Stocking Levels

NOTES:
a. Selected lakes may be surveyed for baseline measurements of key data (1).
b. It is assumed that these lakes have adequate baseline aquatic data to support decision making. If data are found to be inadequate, the missing/inadequate key data sets would be supplemented with baseline sampling and analysis (1) as described in the monitoring plan and in "Table F-4: Management Actions and Monitoring Objectives."

Red numbers (1, 2, 3, 4, 5, 6, 7, 8, 9) indicate monitoring objectives (see "Table F-4: Management Actions and Monitoring Objectives"),

ABIOTIC CATEGORIES—KEY DATA

Water temperature—required to accurately classify lakes for analysis of biotic data and is also used in determining fish removal methodology.

Water conductivity—required to determine effectiveness of electrofishing for use in removing fish.

Lake depth—required to accurately classify lakes for analysis of biotic data and to evaluate best methodology to effectively remove fish. Lake depth data is available for most lakes.

Total Kjeldahl nitrogen (TKN)—serves as a general indicator of lake nutrient levels and is needed to classify lakes for analysis of biotic data. TKN data is available for a moderate number of lakes, but the data is from many lakes and is questionable due to the extreme range of values recorded or the limited number of data points.

Substrate percentage by type (silt, sand, gravel, coarse woody debris, etc.)—needed to classify lakes by type when analyzing benthic macroinvertebrate (BMI) survey data and may be useful in evaluating the biotic integrity of assemblages of other groups of organisms.

Available spawning area (ASA or available spawning gravel) and spawning habitat (inlet, outlet, or beach) type—needed to evaluate the feasibility of fish removal and determine the best methodology for fish removal.

Outlet habitat type (surface, subsurface, none)—needed to determine if it is physically possible for fish in mountain lakes to migrate out of lakes into downstream basins.

Inlet and outlet water flows—needed to determine proper amount of the piscicide antimycin needed to eliminate fish, yet not impact other aquatic biota.

ABIOTIC CATEGORIES— ADDITIONAL DATA POTENTIALLY USEFUL

In addition to TKN, other basic water chemistry/water quality data (pH, water hardness, turbidity, basic nutrients) may be available or could be gathered while collecting water samples for TKN measurements. This information probably should be collected if additional TKN measurements are needed from individual lakes, but may not be necessary for the purposes of monitoring under the plan/EIS. Also, water samples for analysis of anthropogenic pollutants (such as methyl-mercury and persistent organic pollutants could be collected. Results of these analyses would be used to help understand any observed long-term trends in the monitored aquatic communities.

BIOTIC CATEGORIES—KEY DATA

Fish

Fish Presence—information has already been collected for the 91 lakes; however, after fish removal treatments, it would be necessary to survey lakes for fish presence to determine the success of removal treatments. If stocking were continued, fishing mortalities may have to be monitored to determine suitable stocking rates (densities) of nonreproducing fish.

Reproductive status of fish in lakes by species/subspecies/hatchery stock—needed in order to place each lake into one of the three categories used in the monitoring plan. It would also be

used to classify lake by type for the analysis of survey data; that is, fish reproductive status would be required for analysis of BMI survey data under the protocol for the North Cascades Complex.

Species of trout present in lakes—needed in conjunction with reproductive status. This also includes examining suspect populations for hybridization. In some cases, genotypes would probably have to be determined by USGS biological survey. Tissue samples should be collected where fish cannot be identified by physical appearance (phenotype).

Density of reproducing fish—required in order to place each lake into one of the three categories used in the monitoring plan. Also, in lakes where gillnets would be used to reduce fish density, the success of treatment would need to be monitored.

Status of fish population in outlet—needed to assess the potential for escape or extent of escape of stocked populations of trout in mountain lakes to downstream water bodies.

Fishery health—needed as an indication of the quality of sport fishing in lakes that are currently stocked or would be stocked. Elements used to determine overall fishery health would include growth rates, condition factors, and parasite loads.

Amphibians

Three amphibian protocols (snorkel, visual, and trapping) have been utilized during amphibian surveys. Since larvae population densities are required for lake management, it is recommended that snorkel surveys be used for both presence and density information. All three methodologies could be used to determine salamander presence, with snorkeling providing the most reliable presence information. Although trapping may be used for mark-and-recapture estimates of population densities, snorkeling would be the most practical method of determining population densities of amphibian larvae. Amphibian surveys would focus on salamanders, but the presence/abundance of Columbia spotted frogs (*Rana luteiventris*) should also be noted.

Presence of salamander larvae by species—needed to document the presence of either of the two salamander species found in the North Cascades Complex: long-toed salamander (*Ambystoma macrodactylum*) or Northwestern salamander (*A. gracile*). Although the extended rearing period of salamander larvae in lakes (more than one year) increases the probability of detection, how appealing larvae are to fish can vary with weather and climate conditions.

Density of salamander larvae by species—needed to evaluate potential impacts of fish to salamander populations; same problems as described above.

Benthic Macroinvertebrates

Two protocols were used for benthic (bottom dwelling) macroinvertebrate (BMI) surveys. An OSU protocol was used for a provisional inventory of species composition at each lake; however, the methodology developed by staff at the North Cascades Complex has a greater probability of detecting less common or difficult to detect species, and when combined with substrate and vegetation surveys, enables a more detailed analysis and better predictions of species assemblages in the study area lakes.

Although there is some overlap in the lakes surveyed by the two different protocols, coverage is not complete. If the protocol at the North Cascades Complex were used for BMI surveys, additional surveys may be required in lakes that have only been surveyed under the OSU protocol.

Presence and frequency of occurrence of benthic macroinvertebrates by species—needed to determine the biodiversity index for BMI, which can be used to evaluate direct fish impacts to macroinvertebrates. The season of the year when lakes are surveyed, and the fragmented distribution of some species populations, may create issues with the BMI data, which may need compensation.

Zooplankton

Data describing the presence and density of large copepods are needed to evaluate direct fish impacts on zooplankton. Because the presence and densities of individual zooplankton species vary dramatically during the ice-free season, the timing of surveys can create an issue with the comparability of these data between lakes and from year to year.

Three protocols have been used for zooplankton surveys.

Earlier surveys were conducted by the NPS at the North Cascades Complex. Information about the survey methodology is not available, but it does not appear to have been quantitative and appears to have been used only for identification of a few species (large copepods and a few other important taxa).

Zooplankton surveys were also conducted by OSU using more intensive searches. Most of the surveys were not quantitative but only intended to determine presence of each species that were the dominant and subdominant species.

Additional surveys were conducted by OSU using essentially the same protocols used for their initial surveys but with the sampled water volume quantified. It was recommended that this latter OSU protocol be used to quantitatively measure the presence and density of large copepods during lake monitoring.

BIOTIC CATEGORIES—ADDITIONAL DATA POTENTIALLY USEFUL

Surveys of riparian and aquatic vegetation may be required in conjunction with the BMI surveys at the North Cascades Complex to determine the biodiversity index for individual lakes. Other vegetation data would be useful in assessing habitat quality for salamanders or the presence of sensitive plant species:

Riparian vegetation (percent by type: talus, shrub, forbes, forest)—information may be needed to classify lakes by type when analyzing BMI survey data and may be useful in evaluating the biological integrity of assemblages of other groups of organisms.

Presence and status of state-listed plant species or other vegetation that is unique or particularly sensitive to trampling—information would be useful in deciding whether to mitigate for angler use or whether a lake should be closed to restocking.

Aquatic Vegetation (percent of shoreline with aquatic vegetation)—information also may be needed to classify lakes by type when analyzing BMI survey data and may be useful in evaluating the biotic integrity of assemblages of other groups of organisms.

Width of emergent vegetation—useful in determining the survivability of adult salamanders during the breeding season. This could be collected during assessments of the percentage of aquatic vegetation.

Distance to closed-canopy forest—helpful is assessing the availability of adult salamander habitat for pond-breeding salamanders. This information has been evaluated through interpretation of ortho-photographs, actual field measurements of interpretation of better-quality aerial photographs would provide a better assessment.

Descriptions of monitoring protocols for each data category are provided in appendix F-1. The descriptions include a brief explanation of the protocol itself, the number of lakes where it has been performed, and the reason for collecting the data.

ADAPTIVE MANAGEMENT FRAMEWORK

Once the monitoring program has been initiated and *key data* collected, as needed, for each lake in the program, the data would be evaluated and interpreted to determine if a change in management direction would be needed, based on the management objectives. This could be done in a variety of ways, including the development and use of a formal decision support model, such as what is used in the *Northwest Forest Aquatic and Riparian Effectiveness Monitoring Plan* (Reeves et al. 2004) or by the establishment of a decision support framework that would use a designated Technical Advisory Committee to evaluate the data, based on a set of criteria or thresholds that would be developed to guide the decision. The committee would be charged with

establishing priorities as to which lakes to monitor and which physical/chemical/biological parameters to monitor

developing and refining evaluation thresholds/criteria

assessing whether the data indicate that some thresholds have been exceeded or that biological integrity of the system is being compromised

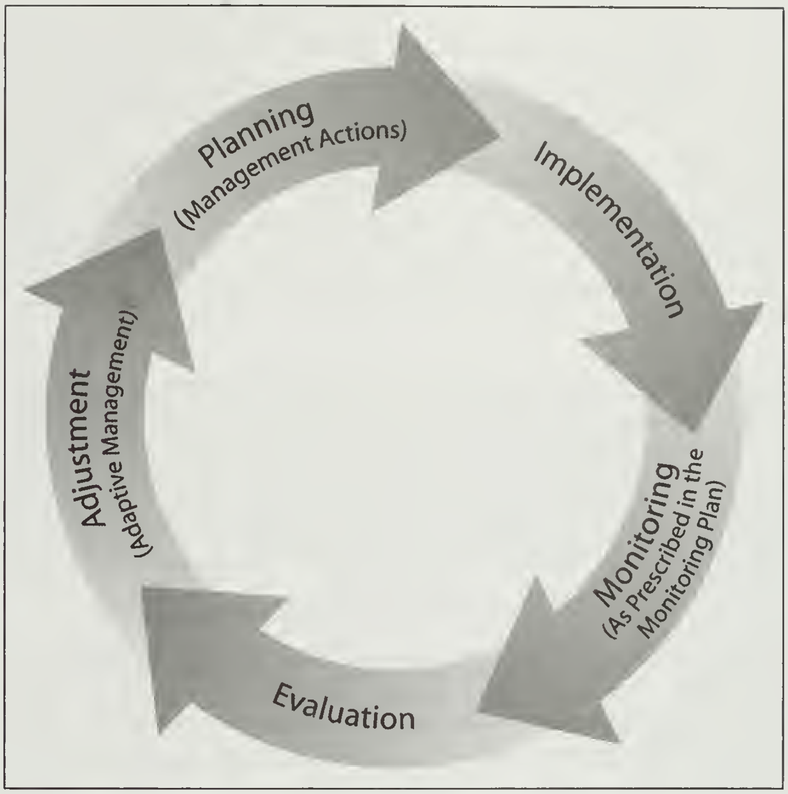
deciding if a change in management actions may be necessary

making other lake management decisions, as needed

At this point in time, a formal decision support model has not been developed for use in this proposed monitoring plan; rather, the following outlines a decision support framework, or decision protocol, that has been developed to provide for a consistent, integrated interpretation of the data, using the best science available. The interpretation would drive future adaptive management decisions, as indicated in figure F-2.

Integral to the adaptive management component of the framework, is continued monitoring and evaluation, as needed, to ensure the management objectives for the lake(s) are being met.

FIGURE F-2: FUTURE ADAPTIVE MANAGEMENT DECISIONS



TECHNICAL ADVISORY COMMITTEE COMPOSITION

A necessary component of this decision protocol is the establishment of a technical advisory committee (TAC) that would review the *key data* categories and validate reference sites and values; define the evaluation factors and criteria; adjust the decision support protocol, as needed, to take into account different indicator weights and relations; apply the criteria; and verify the results. This committee must include regional and provincial experts who represent interagency and interdisciplinary skills and who can draw upon the expertise and knowledge of local research and field staffs, as necessary. The TAC for the monitoring plan would consist of key researchers in the NPS, WDFW, and USGS who have been involved in past monitoring in the North Cascades Complex. In addition, other TAC members who would be familiar with the North Cascades Complex and the ecology of high mountain lakes may include informed citizens or the scientific community associated with local universities, the U.S. Environmental Protection Agency, and U.S. Forest Service.

Initially, TAC members could include the following: Roy Zipp (Natural Resource Specialist—North Cascades Complex), Reed Glesne (Aquatic Ecologist—North Cascades Complex), Bob Pfeifer (Inland Fisheries Management Biologist, Habitat Biologist—WDFW), Mark Downen (Inland Fisheries Biologist—WDFW), and John Wullschleger (Fisheries Biologist—NPS, Fort Collins, CO). Roy Zipp would serve as chairman of the TAC. Bob Hoffman (OSU Research Professor/USGS) would serve as technical advisor to the committee. The specific individuals on the TAC would likely change as the monitoring program evolves.

FRAMEWORK FOR DECISIONS

The basic framework would initially involve the TAC examining a suite of physical and biological indicators (the *key data* categories discussed above) to evaluate the condition of the subject lake (the “observed”), relative to a selected baseline (the “expected”). For each lake, the TAC would examine all the key data or indicator values that would be monitored under that lake’s designated management action (see table F-3). Then, the TAC would use a multiple-lines-of-evidence approach to determine what level of change in the data would indicate a need for a change in management. Biological assemblages would be assessed in combination with physical and chemical attributes. The TAC would then interpret the suite of data as a whole, examining the indicator values, the amount of difference between “observed” and ‘expected” values, and the interdependence among various factors to evaluate a lake’s condition and condition of shoreline vegetation.

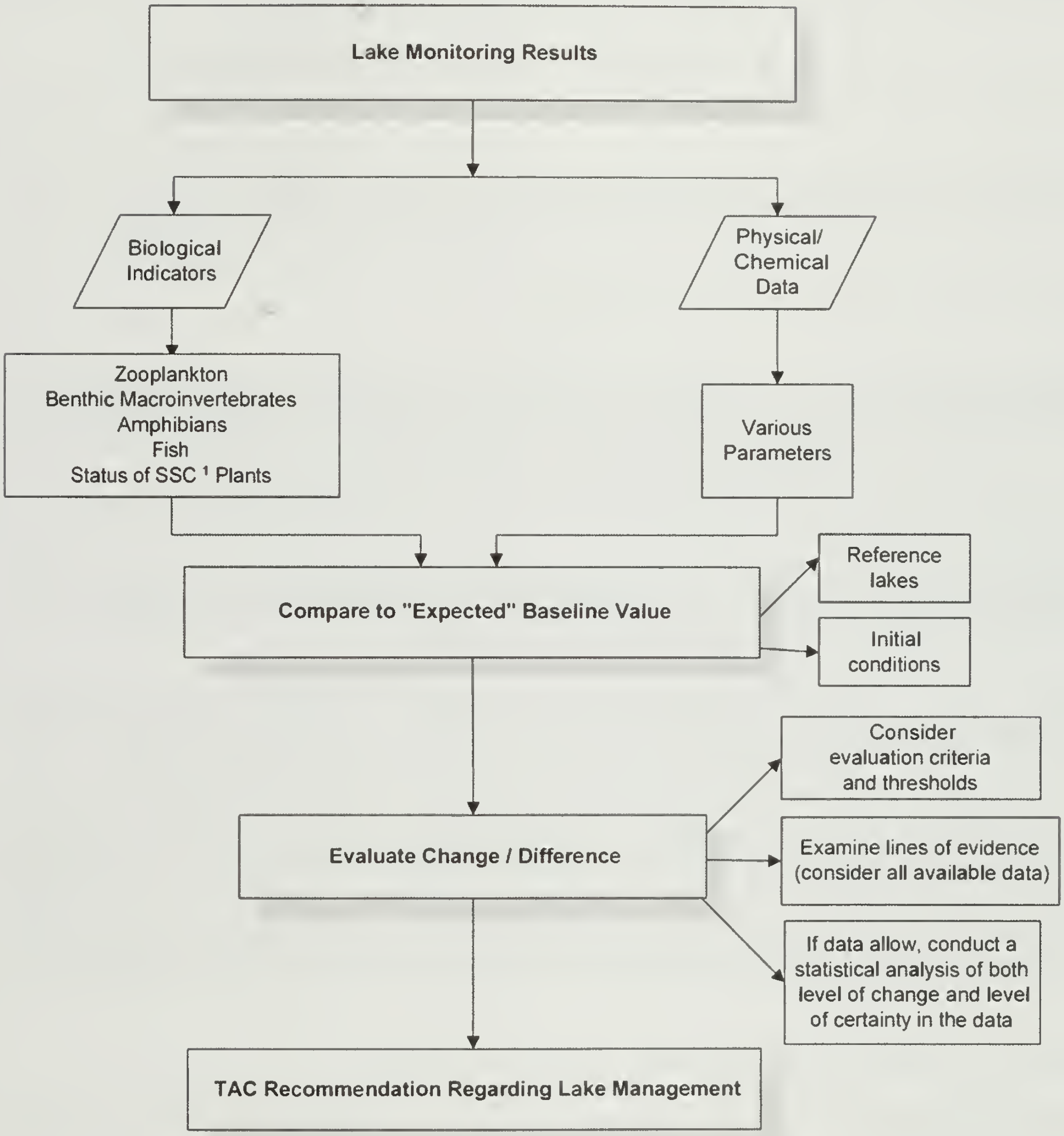
In general, the “expected” baseline would consist of similar data from a reference lake or lakes—generally historically fishless lakes of the same or similar class. General lake classes would be assigned based on work performed by Lomnicky et al. (1989). The first level of classification would separate the lakes into two major geographic regions with large-scale differences in climate, aspect, and vegetation, based on location east or west of the hydrological divide (Cascade Crest) of the Cascade Mountains. The second level of classification, representing smaller variations in ecological habitat, would also be considered.

Where distribution, habitat requirements, or species assemblages of indicator species or species assemblages are better known, reference lakes could be grouped by data specific to the indicator taxa. A predictive model for BMI species assemblages has been developed where mountain lakes in the North Cascades Complex are classified into six biologically similar groups based on location west (four groups) or east (two groups) of the hydrological divide and similarity of their BMI species composition (species assemblages), using ordination or clustering methods. Lake classes for predicting presence, species, and relative abundance of salamander larvae could be grouped by side of hydrologic divide, range of salamander distribution, lake fertility (measured by TKN value), and distance from other known or potential breeding lakes. The dominant large copepod (*Diaptomus kenai*) are strongly associated with lakes that have temperatures greater than 50°F, while small copepods (*D. tyrrelli*) are strongly associated with shallow (less than 33 feet in depth) lakes with higher TKN values (Liss et al. 2002). Lake depth and TKN values are not correlated with the presence of large copepods, but their relative abundance in lakes with high densities of reproducing trout tends to be much higher in lakes greater than 33 feet in depth.

Data from the subject lake could also be compared with the initial conditions of the lake, or previously obtained monitoring results, to see what changes have occurred in the lake over time. Using this as a baseline would not imply that this would serve as the desired condition for the lake. It would, however, provide a baseline from which it would be possible to determine if application of the management actions are resulting in the desired change and the conditions in the lake are moving in the desired direction (in other words, is the observed change meeting the management objectives).

If the TAC agrees (by a consensus decision) that the observed change (such as reduction in fish density and reestablishment of indicator taxa) is meeting management objectives, management actions for the lake would not be changed. If, however, there has been no change or a significant change from the expected/desired value, and this cannot be explained by variables other than fish density or fish condition, a change in the management action would be indicated. Figure F-3 provides an illustration of the basic decision framework.

FIGURE F-3: BASIC DECISION FRAMEWORK


Lake Monitoring Results
Biological Indicators
Physical/ Chemical Data
Zooplankton
Benthic Macroinvertebrates
Amphibians
Fish
Status of SSC 1 Plants
Various Parameters
Compare to "Expected" Baseline Value
Reference lakes
Initial conditions
Evaluate Change / Difference
Consider evaluation criteria and thresholds
Examine lines of evidence (consider all available data)
If data allow, conduct a statistical analysis of both level of change and level of certainty in the data
TAC Recommendation Regarding Lake Management

Note: 1. Species of Special Concern

EVALUATION THRESHOLDS

Absent a formal model, the TAC would be charged with evaluating the levels of change and their implication for lake management. The actual thresholds/criteria for each biotic and abiotic parameter cannot be defined at this time but would be defined initially by the TAC based on previously collected data. Thresholds for each data type would include the actual measurements/observations plus the associated data variability. The thresholds would be refined by the TAC as the monitoring program progresses. Park- or region-wide trends, as monitored in reference lakes, would be factored into all management decisions. Any changes in fishery management would require consideration of all appropriate data in a line-of-evidence approach and would require consensus of the TAC. The types of thresholds/criteria to be considered by the TAC would include, at a minimum, the following:

If the data for a parameter are statistically adequate, a change based on one or two standard deviations from expected would be applied.

If the data for a parameter are quantitative, but could not support a statistical evaluation, thresholds based on a percent change from baseline would be applied.

If the data for a parameter are qualitative, the observed changes would be classified as minor, moderate, or major and considered in conjunction with the quantifiable data.

PRIORITIES FOR MONITORING

Monitoring priorities must be set to determine which lakes should be monitored and which monitoring data types should be collected for each lake monitored. As described earlier, one of the initial activities for the TAC would be to establish priorities as to which lakes to monitor and the *key data* required for monitoring. Both prioritization activities would have to consider budget and schedule constraints. The following are the factors that would be considered when prioritizing lakes for monitoring:

Highest Priority—lakes requiring evaluation before a management action could be selected and implemented. These lakes would require further inventories of baseline conditions; the inventories would provide the basis for longer-term monitoring.

High Priority—lakes with management actions identified based upon sufficient baseline information. These lakes would be monitored to evaluate the success of management actions.

Low Priority—lakes with management actions identified but no current plans for implementation. These lakes would include the larger, deeper lakes in the North Cascades Complex that are targeted for fish removal. Also, fishless lakes selected to act as reference lakes would be categorized as either low- or high-priority lakes, depending on data needs and budget/schedule constraints. Data needs on trends in the North Cascades Complex may be satisfied using information compiled from higher-priority lakes or from other monitoring programs.

The factors to consider when prioritizing data types would include

Highest Priority—data that are considered *key data*. These data must be collected during baseline studies and monitoring in order to make management decisions.

High Priority—data that would help interpret the *key data*. These data, while not considered *key*, would help to interpret the consequences of management actions if the *key data* could not be conclusively interpreted. Should be considered for collection if funding and schedule permit.

Low Priority—data that would be nice to gather while a lake is being sampled but would not be used directly or indirectly by the NPS to make lake management decisions. Because these data may be useful to other researchers or fishery managers, the data may be collected if incremental costs and effort would not be excessive and if other sources of funding could be identified.

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CITED IN APPENDIX F

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APPENDIX F-1
SUGGESTED SURVEY PROTOCOLS

APPENDIX F-1: SURVEY PROTOCOLS

The categories listed below cover data categories that must be collected in the field, rather than by analysis of Geographic Information System (GIS) data and interpretation of aerial photographs. Where data (zooplankton presence and relative densities, amphibian presence and densities, water temperature, total Kjeldahl nitrogen [TKN]) would be expected to vary significantly over the ice-free season or from year to year, multiple samples (three or more) may be required to increase confidence in the collected data.

ABIOTIC CATEGORIES

PROTOCOLS FOR OBTAINING KEY DATA

Surface (epilimnetic) water temperature—from Hoffman et al. (2003). Temperature is measured in centigrade over the deepest spot in lakes at 1 meter (3.28 feet) from the surface and again half way to the bottom using a hand-held thermometer and a remote thermistor (thermocouple). Temperatures are recorded on warm summer days during the warmest period of the day (thermal maxima)—around 2:00 P.M.

Surface water temperature has been determined for 74 lakes. Mid-depth temperatures have not been taken but are useful in determining if thermal stratification occurs in a lake. Water temperatures are needed in the monitoring program to assess lake productivity and characterize lake habitat and expected biotic community.

Lake depth—from Hoffman et al. (2003). A handheld sonar device or calibrated line is used to determine a lake's deepest point. At a minimum, two perpendicular depth transects intersecting at the deepest point of the lake are conducted. When determined, the maximum depth and the UTM (Universal Transverse Mercator) coordinates of its location are recorded.

Maximum depths have been determined for 77 lakes. Maximum depths are needed in the monitoring program to help determine the most appropriate methods to use to remove fish and to characterize the basic lake habitat and expected biotic community. Transect depth profile data are needed to calculate the lake volume for use in estimating the volume of antimycin needed to remove fish.

Total Kjeldahl nitrogen (TKN)—from Hoffman et al. (2003). Water samples are collected for measuring TKN and a suite of water chemistry variables. A minimum of 1 liter sample of filtered lake water and 250 milliliters (ml) sample of unfiltered lake water should be collected at the deepest point of each lake and processed in the field by methods described in Hoffman et al. (2003). Samples will be transported out of the field and stored in a refrigerator for laboratory analysis. Additional samples (field duplicates) may be collected to ensure confidence in the repeatability of the data.

TKN values have been determined for 62 lakes. TKN values are needed in the monitoring program to help determine lake productivity and characterize lake habitat and expected biotic community. Additional water chemistry variables, including pH, alkalinity, conductivity, total dissolved solids, ammonia, nitrate-N, total phosphorus (and cations [positive ions] and anions [negative ions] if desired) may also be determined during laboratory analysis of the water samples. Samples for anthrogenic pollutants (e.g.,

persistent organic pollutants [POPs] or methyl-mercury) may also be collected at the same time as other water quality sampling.

Chlorophyll-a concentration—from Hoffman et al. 2003. Water samples may be collected for measuring Chlorophyll-a. A minimum 500 milliliter (ml) sample of filtered lake water should be collected at the deepest point of each lake and processed in the field by methods described in Hoffman et al. (2003). Samples will be transported out of the field and stored in a freezer until the sample is processed in the laboratory. Additional samples may be collected to ensure confidence in the repeatability of the data.

Chlorophyll-a values have not been determined for any of the lakes. Chlorophyll-a values are needed in the monitoring program as an indication (in addition to TKN) of lake productivity.

Dominant littoral substrate. The dominant littoral (near shore) zone substrate is estimated within 10% categories (silt, sand, gravel, cobble, coarse woody debris, etc.) during a visual examination of the perimeter of the lake.

Dominant littoral zone substrates have been determined for 25 lakes. Dominant littoral substrates measured in 10% increments is needed to characterize lake habitat and expected biotic community.

Available spawning area (ASA or available spawning gravel) and spawning habitat (inlet, outlet, or beach) type. Stream spawning gravels are assessed by walking all tributary and outlet streams until a barrier to upstream migration is reached. The percent of available spawning gravel in each segment is estimated and recorded. This data is used to calculate the amount of available stream spawning habitat. Available lake spawning gravel can be located by snorkel surveys of the littoral zones of mountain lakes during salmonid spawning periods. Generally, this area can be mapped accurately by recording redds (spawning areas) or surveying extent of upwelling area with flow metering devices. The recruitment new-year classes of trout fry in most lakes is limited by the available area of spawning gravel, rather than the number of available spawning females.

Field surveys indicate that limited spawning habitat is available at Wilcox/Lillie, Upper Lake (EP-06-01). Available spawning area has not been determined for any of the other study area lakes. Data describing available spawning habitat are needed as input for determination of the most effective fish removal technique and as an indication of the sustainability of trout populations in lakes with low levels of trout reproduction.

Outlet habitat type (surface, subsurface, none). Lake outlets where reproducing trout are present should be surveyed to determine if an accessible surface outlet exists that trout can utilize to migrate downstream from lakes into downstream basins. Although some lakes have been determined to have no outlets based on available mapping data, this should be confirmed in the field. In many cases, mapped outlets do not actually flow on the surface or do not receive water from mountain lakes. In other cases, an outlet stream may cease to have a surface channel and will flow subsurface for a considerable distance. For these reasons, it is recommended that, where there is concern that nonnative fish may enter stream basins through mountain lake outlet streams, the outlet stream be surveyed to determine if there is a complete surface connection to downstream basins. Surveys should extend to known perennial streams and preferably to the upstream limit of native fish distribution. Document any falls considered to be barriers to upstream fish migration for the native species in the downstream lake/pond.

Outlet habitat type has been estimated for all lakes from GIS data, but not confirmed in the field. An accurate assessment of outlet habitat type is needed in the monitoring program to assess the potential of nonnative trout in mountain lakes colonizing downstream basins.

Inlet and outlet flows. Inlet and outlet flows would be measured using a propeller flow meter in a measured flow channel (width and depth). By counting the number of revolutions over one minute, the flow in cubic feet per second can be calculated.

Inlet and outlet flows have not been measured at any lakes. These data are needed as input to the estimate of the volume of antimycin needed to remove fish.

BIOTIC CATEGORIES

PROTOCOLS FOR OBTAINING KEY DATA

Fish Surveys

Fish presence. Rod-and-reel angling, gillnet fishing, visual-encounter surveys, snorkel surveys, seining, electrofishing, or trapping can be used to determine fish presence or absence and species present, and with the exception of visual-encounter surveys and snorkel surveys, to collect meristic data (e.g., total and fork lengths, weight, sex, and age) and tissue samples for genetic analysis or analysis for methyl-mercury or persistent organic pollutants. Fish presence has been evaluated for all study area lakes, but data from several lakes are not considered reliable. A combination of gillnet and rod-and-reel angling gives the best combination of presence by species, meristic data, and tissue samples. Where it is necessary to determine the presence of fry (when determining if reproduction is occurring or if fish have been successfully removed from a lake), a combination of seining, trapping, snorkel surveys, and visual-encounter surveys may be required.

Where it is necessary to confirm the removal of reproducing populations of fish, a lake should be surveyed annually for the presence of fish. A period of at least 3 years with no detection of fish should pass before fish removal is considered a success. In lakes where reproduction has not been documented, and fish are to be removed through the cessation of stocking, the lake should be surveyed for fish approximately 10 years after the last stocking. If fish are observed, but numbers appear to be few, and fish are from the age class of the last stocking, the lake should be surveyed for fish presence periodically until no fish can be detected. If young fish are observed, the lake should be evaluated for the presence of natural reproduction.

Fish-presence surveys are necessary to confirm the presence or absence of fish, determine species of fish present, and to collect meristic data and tissue samples. Confirming the absence of fish requires a more intensive effort over a greater period of time than confirming presence and visual means of surveying. (Note: visual-encounter surveys and snorkel surveys do not allow the collection of any data other than confirmation of the presence of fish, although population densities can be estimated from quantified snorkel surveys.)

Species of trout present in lakes. Fish should be collected by one of the methods listed above under fish presence. Bias in sampling should be avoided by using multiple methods of collection to obtain as complete a collection of age classes and species present as possible. Fish should be field identified by specimen, but photographs and tissue samples (in 95% ethanol) should also be collected for verification of the species of fish that are present in the lake.

The trout species present in lakes have been determined to various degrees of accuracy for all lakes, but several lakes need additional data to confirm the identity of species/subspecies/hatchery stock. This information is needed to determine if reproducing fish in lakes are not native to the stream basin into which the lakes drain.

Indices of condition of fish. Fish should be collected by one of the methods listed above (except for snorkel surveys and visual-encounter surveys) under "Fish Presence." Meristic data can be collected and recorded from the sampled fish. Indices of condition (such as Fulton Condition Factors), relative condition factor, or relative weight can be calculated from measurements of length and weight. The sex, species, and time of year that data is collected should be recorded along with meristic data. These factors can have a strong bearing on how the data is evaluated (condition can vary by sex, species, age, spawning period, and time of year).

Condition factors have not been collected for the *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS), but data may be available for some of the 91 study area lakes. Indices of fish condition are needed to manage the fishery in lakes where the effects of fish stocking are evaluated. Condition factors also may be used as an indication if fish densities have exceeded the carrying capacity of a lake, providing a rough approximation of effects on native biota.

Growth rate of fish. Fish should be collected by one of the methods listed above (except for snorkel surveys and visual-encounter surveys) under "Fish Presence." Meristic data can be collected and recorded from the sampled fish. Samples of fish scales and otoliths (particles of calcium carbonate found in the inner ear of vertebrates) should also be collected to age fish so that growth rates by length and weight can be calculated. The sex, species, and time of year should be recorded along with meristic data. These factors can have a strong bearing on how the data is evaluated (condition can vary by sex, species, age, spawning period, and time of year).

Growth rates of fish have not been collected for this plan/EIS, but data may be available for some of the lakes. Growth rates are needed to manage the fishery in lakes where fish stocking would continue. Growth rates also may be used as an indication if fish densities are having effects on native biota. Growth rates can also provide a good approximation of lake productivity.

Parasite load of fish. Fish should be collected by one of the methods listed above (except for snorkel surveys and visual-encounter surveys) under "Fish Presence." Sampled fish can be dressed in the field and the gills, skin, viscera, and muscle tissue examined for the presence of parasites. Sampling of live fish is mandatory for parasite examination because many external parasites leave fish within minutes after the host's death. As a result, when using gillnets to sample fish, nets should be sampled frequently. An external examination and necropsy (autopsy) conducted in the field may provide useful general information, but a complete parasite examination requires at least a good dissection microscope and a person with fish health training for a definitive inventory of parasites. This would require transport of living fish from the field. As a result, parasite examinations in the field would be limited to judgments of the severity of infections by an experienced biologist or technician. Methods described in Murphy and Willis (1996) should be used for the examination of fish parasite loads.

Parasite load data have not been collected for this plan/EIS, but this data may be available for some of the lakes. Estimates of fish parasite loads are needed to manage the fishery in lakes where fish stocking would continue. Fish parasite loads may be used as an indication if fish densities have exceeded the carrying capacity of a lake, providing a rough approximation of effects on native biota. High loads of parasites can be a sign of environmental stress, such as low levels of available forage organisms and organic and inorganic pollutants.

Reproductive status of fish in lakes by species/subspecies/hatchery stock. Fish should be collected by one of the methods listed above (except for snorkel surveys and visual-encounter surveys) under "Fish Presence." The age of the specimens should be verified through the collection of scales and otoliths as described below under the section on density of reproducing fish. Length frequency distributions should not be used to distinguish different stocking efforts or year classes (Nelson 1988). Bias in sampling should be avoided by using multiple methods of collection to obtain a complete a collection of age classes and species present. At least 20–30 individuals should be collected, if possible. After the ages of collected fish are determined by examination in a laboratory, this information should be compared to documented fish stocking. The presence of many age classes of fish that were not documented in stocking records can be considered documentation of reproduction, with confidence increasing with the number of reproducing fish of various age classes present. A single age class, not the product of a documented stocking, may represent an undocumented stock and should be regarded as suspect (although many lakes may have reproduction only in years with favorable climate and water level conditions). Photographs and tissue samples (in 95% ethanol) should also be collected for verification of the species of fish that is reproducing in the lake.

The reproductive status of fish in lakes has been determined to various degrees of accuracy for all lakes, but several lakes need additional data to confirm determinations as to reproductive status and the identity of species/subspecies/hatchery stock that are reproducing. This information is needed to determine if a reproducing population exists in a lake and if the reproducing fish are not native to the stream basin into which the lake drains.

Density of reproducing fish. Mark-recapture methods (Gresswell et al. 1997) and gillnet sampling (Nelson 1964, 1972, 1984, 1988) can be used to determine the density of reproducing fish in lakes. Snorkel surveys similar to those for salamander larvae (Hoffman et al. 2003) can be used.

The density of reproducing fish has been determined through mark-and-recapture for 8 lakes and population densities based on average densities in the literature for the reproducing species have been estimated for an additional 18 lakes. This information is needed to assess the level of effect trout populations have on native biota, such as zooplankton (relative abundance of larger copepods), and salamander larvae (density and presence).

Status of fish population in outlet streams. Fish populations in outlet streams may be assessed to determine if nonnative fish stocked in mountain lakes are migrating downstream from lakes and either hybridizing or replacing native fish populations in downstream basins. In addition, nonnative fish may be colonizing reaches of streams above the range of native fish with possible effects on native biota.

The historic distribution of native fish in streams should be determined as accurately as possible from the available literature and fish inventory reports. Fish distribution is usually limited to the first major barrier falls on tributary streams, but sometimes there is a gradual loss of fish species diversity as successive barrier falls are encountered, while moving upstream. Where there is concern about the escape of reproducing trout from mountain lakes into downstream basins, or a need to prioritize lakes for fish removal by their effects to native fish populations in downstream basins, the upper limit of fish distribution should be approached by the most direct (or easiest route) available. At least two crewmen should participate in field surveys. The presence of fish should be determined by a combination of habitat evaluation (gradient and pool structure), visual encounter (using Polaroid glasses to more easily observe movements of fish in stream pools), and a backpack electrofisher and dip net. If fish cannot be found, survey downstream until the upstream limit of native fish distribution is found. Document any falls considered barriers to upstream fish migration. (Note: different fish species have different abilities to navigate barrier falls.) Sample 20–40 fish (if available) to determine species composition. If nonnative fish do not appear to be present, stop downstream survey; however, collect meristic information and tissue samples from sampled fish for later analysis of possible hybridization. Take photographs of sampled fish.

Survey either upstream to barrier for native fish or downstream from lake outlet, noting physical barriers to upstream movement. If no fish habitat (lower gradient reaches with pools) exists between the lake

outlet and upper limit of fish distribution, it is only necessary to survey downstream from the lake until a reach of 100 meters (328 feet) of stream is surveyed with no fish encountered. When surveying upstream from the limit of native fish distribution, the survey can stop when nonnative fish are first encountered.

The colonization of a lake's outlet stream by nonnative trout stocked in the lake has only been documented for McAlester Lake. There is some evidence of downstream migration and colonization with reproducing populations of trout for 8 lakes. Densities of reproducing fish have been determined through mark-and-recapture for 8 lakes, and population densities based on average densities in the literature for the reproducing species have been estimated for an additional 18 lakes. This information is needed in the monitoring program to assess the extent of colonization of outlet streams and downstream basins by nonnative trout stocked in mountain lakes and its effect on native fish and other taxa.

Amphibian Surveys

Three amphibian protocols (snorkel, visual, and trapping) have been utilized during amphibian surveys. All three methodologies can be used to determine salamander presence, with snorkeling (Hoffman et al. 2003) providing the most reliable presence information. Trapping (Adams et al. 1997) can also provide highly reliable presence information, but the number of traps necessary to approximate detection abilities of snorkel surveys may be prohibitive at most mountain lakes.

Since larvae population densities are required for lake management, it is recommended that snorkel surveys be used for both presence and density information when surveying for salamander larvae. In addition to snorkel surveys for the determination of salamander larvae presence and densities, a visual-encounter survey should be conducted for frogs and toads using protocols outlined in Olson et al. (1997), Tyler et al. (1998), Brokes (2000), Hoffman et al. 2003, Thoms et al. (1997), Bury and Major (1997), and Crisafulli (1997). If frogs or toads (adults) are documented during visual-encounter survey, dipnets should be used to capture specimens, which can either be used for field identification (with photographs), as voucher specimens, or as sources of tissue samples for genetic analysis and identification.

Snorkel surveys for salamander larvae (along with visual-encounter surveys for other amphibians) have been conducted in 53 lakes. An additional 7 lakes have had visual-encounter surveys for amphibians. This information (presence and abundance of salamander larvae and presence of any other amphibians) will provide an estimate of effects of fish on native biota.

Benthic Macroinvertebrate Surveys

Two protocols have been used for benthic (bottom dwelling) macroinvertebrate (BMI) surveys. An Oregon State University (OSU) protocol was used for a provisional inventory of species composition at each lake; however, the methodology developed by personnel at the North Cascades Complex has a greater probability of detecting less common or difficult-to-detect species and was combined with substrate and vegetations surveys that enable a more detailed analysis and better predictions of species assemblages in the study area lakes. BMI survey data from the North Cascades Complex was used to develop a BMI index of water quality and biological integrity. Samples are collected using kick-and-sweep techniques for approximately 6 minutes at each of five randomly located sites at each lake, within the 1 meter (3.28 feet) depth contour.

BMI data using the North Cascades Complex protocol has been collected at 43 lakes (OSU BMI data is available for 23 of these lakes), with BMI data using the OSU protocol collected at an additional 16 lakes. The information is needed for the monitoring program to assess the biotic integrity of the BMI data in lakes by determining if the BMI assemblages of lakes fall within the their expected range of biodiversity or if the assemblages are being affected by high densities of fish.

Zooplankton Surveys

Three protocols were used for zooplankton surveys. Earlier surveys were conducted by personnel at the North Cascades Complex using protocols similar to those used by OSU during later surveys (Hoffman et al. 2003). These surveys primarily documented the taxa present in lakes and grouped them as dominant or subdominant in the zooplankton species assemblages. Zooplankton surveys also were conducted by OSU using essentially the same protocols but with the volume of sampled lake water quantified, so relative densities of large copepods and *D. tyrrelli*/volume of water surveyed could be determined for each lake. It is recommended that the quantitative OSU protocols be used to measure for the presence and density of large copepods and other zooplankton species. Both vertical and horizontal tows should be used in deeper lakes, with only horizontal tows 25 meters (82 feet) in length used in lakes less than 2 meters (6.5 feet) in maximum depth. In lakes that are greater than or equal to (•) 2 meters maximum depth, at least three replicate vertical tows and one horizontal tow of approximately 25 meters in length should be performed.

Zooplankton presence data has been collected at 53 lakes, with relative abundance data collected at 20 of the 53 lakes. Zooplankton presence and relative abundance (at least for large copepods) is needed for the monitoring program to assess the effects of trout populations on zooplankton communities.

Vegetation Surveys

Surveys of riparian and aquatic vegetation may be useful (but not required) in conjunction with the BMI surveys and surveys for other taxa to characterize lake habitat and expected biotic communities.

Riparian vegetation (percent by type: talus, shrub, meadow, forest). The riparian vegetation is estimated within 10% cover categories (shrub, forest, meadow, talus) during a visual examination of the perimeter of the lake. Meadow species include both forbs (broad-leaf plants) and graminoids (grasses and sedges).

Riparian vegetation percent by type has been determined through field observation for 43 lakes. Riparian vegetation for the remaining lakes has been assessed through interpretation of aerial photographs, but the estimates have not been checked through ground observations. Riparian vegetation measured in 10% increments may be used to characterize lake habitat and expected biotic community. Both data types provide rough cover estimates, but they cannot be used to identify the specific types of vegetation that may be present in the riparian communities. The status (trampled or healthy) of the riparian vegetation can also be used to estimate usage by recreational anglers.

Aquatic vegetation (percent of shoreline with aquatic vegetation). The percentage of shoreline with aquatic vegetation present in the littoral zone is estimated within 10% categories during a visual examination of the perimeter of the lake.

Aquatic vegetation percentage has been determined for 43 lakes. The percent of shoreline littoral zone with aquatic vegetation may be used to characterize lake habitat and expected biotic community.

Additional vegetation data potentially available, but not necessarily needed, include

> *Width of emergent vegetation*—This information, which is useful in determining the survivability of adult salamanders during the breeding season, could be collected during assessments of the percentage of aquatic vegetation. Up to 30% of the breeding adult Northwestern salamanders leaving lakes in the Mt. St. Helens Volcanic Monument without emergent shoreline vegetation have been observed to be visibly maimed by feeding trout (Dr. Crisafulli, pers. comm., 2003).

Distance to closed canopy forest—This information has been evaluated through interpretation of ortho-photographs; however, actual field measurements of interpretation of better-quality aerial photographs would provide a better assessment of the availability of adult habitat for pond-breeding salamanders.

Additional vegetation data not currently available that should be collected include

Specific types of vegetation present in the riparian zone—The cover categories used to characterize the riparian and aquatic vegetation types are very general and do not indicate the specific types of vegetation present in those communities. Low, woody shrubs (such as *Phyllodoce* spp.), seedlings, and forbs are more sensitive to trampling and take longer to recover than do tall, woody shrubs (such as *Salix* spp.) and graminoids (Cole and Trull 1992). Assessments of the status of riparian vegetation should take into account the types of vegetation impacted. Recreational users should be informed to avoid heavily impacted areas, especially those communities sensitive to the effects of trampling.

Presence of state special status species—None of the lakes have been surveyed for the presence of riparian or aquatic state special status plant species. Because state special status species are rare and often occur in small populations, any trampling of those populations has the potential to have a major impact on the species. As resources and funds allow, surveys for special status species should be conducted by a qualified plant biologist in conjunction with surveys for other biota.

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Appendix G

DETAILED DISCUSSION OF IMPACT THRESHOLDS FOR AQUATIC ORGANISMS

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APPENDIX G: DETAILED DISCUSSION OF IMPACT THRESHOLDS FOR AQUATIC ORGANISMS

IMPACT CRITERIA AND METHODOLOGY

Four separate sets of impact thresholds, ranging from negligible to major intensity, were defined to address potential impacts on the plankton, macroinvertebrates, and amphibians in the 91 study area lakes and native fish in downstream drainages. Because there is incomplete knowledge of the actual impacts that are occurring or could occur in the 91 lakes under all four alternatives, impact thresholds were developed using predictive factors that have been shown to affect the distribution and viability of these organisms. These factors were identified from a review of scientific literature and past research. In addition to predictive factors, data and professional knowledge supplied by National Park Service (NPS) and Washington Department of Fish and Wildlife (WDFW) staff involved in the preparation of this *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS) were used to arrive at impact intensities, whenever possible. The assessments were done on a lake-by-lake basis, using impact thresholds based on both the predictive factors and actual knowledge of site conditions, to arrive at a final impact level for each lake and associated downstream drainage.

The discussions below present more detail about the predictive factors that were used in the impact thresholds for four groups of aquatic organisms.

PLANKTON

The plankton community in lakes in the North Cascades National Park Service Complex (North Cascades Complex) is divided into two components: phytoplankton and zooplankton. Phytoplankton mainly include microscopic photosynthetic algae (such as diatoms and dinoflagellates), while zooplankton are non-insect invertebrate animals ranging in size from microscopic to as large as 0.25 inch in length that drift with the current.

The direct and indirect effects of fish stocking on each of these community components differ. Stocked trout generally do not prey directly on phytoplankton but can indirectly cause significant changes in the abundance of individual species and overall community structure in mountain lakes because their presence indirectly results in altered nutrient cycling and food web dynamics (Brett et al. 1994; Drake and Naiman 2000; Elser et al. 1995; Leavitt et al. 1994). While changes in abundance and community structure can be substantial, total loss of phytoplankton species has generally not been observed. Shifts in community composition (referred to as "state changes") tend to remain stable following fish removal, not returning to conditions that were present prior to fish stocking (Drake and Naiman 2000). Changes in the phytoplankton community caused by fish stocking resemble those that occur due to other natural events (e.g., catastrophic forest fires or volcanism).

Because changes to the phytoplankton community due to fish stocking are similar to those that occur under natural conditions, and food web dynamics generally remain resilient, effects on the phytoplankton community from fish stocking were considered minimal for the purpose of evaluating impacts. Therefore, the focus was placed on impacts to zooplankton species, especially larger copepods, which can be demonstrably affected by predation and changes in food web dynamics resulting from fish introduction.

Research has shown that, in some cases, fish introductions have been observed to result in the complete elimination of some zooplankton species, with large copepods and large cladoceran species appearing to be most vulnerable. For example, large copepods in high-altitude lakes in Alberta, Canada, were no longer present as a result of very high densities of reproducing trout in some mountain lakes and, in some cases, did not recover following fish removal (Parker et al. 1996, 2001). This level of effects was observed to occur only in smaller shallow lakes (Donald et al. 1994). Another recent study found that the average recovery time for zooplankton assemblages from the influence of stocked salmonids in Canadian lakes was 19 years (Donald et al. 2001).

Failure of copepods to recover has been attributed to the presence of scuds, or large amphipods (*Gammarus lacustris*), that prey on dormant copepod eggs, thus eliminating the potential for population recovery (Parker et al. 1996). Cladoceran species in shallow lakes were also no longer present in some cases, but they are likely to recover (Parker et al. 2001). Large amphipod species may also be vulnerable to extirpation (complete disappearance of a species) resulting from intense predation. It should be noted that zooplankton species were not extirpated in deeper lakes, even lakes with extremely high stocking densities (exceeding 800 fish/acre), because the profundal (deep) zone provides a refuge area against predation. Lakes greater than 50 feet in depth appear to provide sufficient refuge habitat for the large copepod and cladoceran species that are most vulnerable to extirpation (Donald et al. 1994). Similarly, larger lakes with more overall refuge habitat can provide areas for escape from fish predation. A size of 40 acres was selected for use in the impact thresholds (based on professional judgment and experience working in similar lakes) to help distinguish between impact levels.

Based on the information described above and the professional knowledge and judgment of the NPS and WDFW staff involved in this plan/EIS, the following impact thresholds were defined for plankton (to be applied on a lake-by-lake basis):

Major: Significant changes in community structure would potentially occur, and large copepod abundance would be reduced significantly such that they are undetectable. If fish were removed or died off, the community structure may not become comparable to currently fishless lakes. For this assessment, potentially major impacts to large zooplankton would be expected in a lake where the following predictive factors are found:

- Lake depth less than (<) 50 feet , and
- Lake area <40 acres, and
- Fish density is very high (reproducing trout or multiple age classes at greater than [>] 400 fish/acre)

Moderate: Noticeable changes in community structure would potentially occur, and large copepod abundance would be greatly reduced. If fish were removed or died off, the relative abundance of large copepods would increase. For this assessment, potentially moderate impacts to large zooplankton would be expected in a lake where the following predictive factors are found:

- Lake depth <50 feet, and
- Lake area <40 acres, and
- Fish density is high (reproducing trout at >50 fish/acre).

Minor: Minor changes in community structure would potentially occur. If fish were removed or died off, the community structure would become comparable to currently fishless lakes. For this assessment, minor impacts to the zooplankton community would be expected in a lake where the following predictive factors are found:

- Lake depth >50 feet, or
- Lake area >40 acres, or
- Fish density is low (stocked trout at <100 fish/acre or reproducing trout at <50 trout/acre).

Negligible: Long-term adverse impacts would potentially be negligible even though these lakes have historically been stocked. Abundance and community structure would be expected to be influenced primarily by biogeographical and evolutionary processes. For this assessment, negligible impacts to the zooplankton community would be expected in a lake that was previously stocked but is currently fishless.

Table G-1 (located at the back of this appendix) provides the analysis matrix used for the assessment of impacts on plankton, by alternative, for each of the 91 lakes in the study area.

MACROINVERTEBRATES

Impacts on the macroinvertebrate community were evaluated by considering the effects of fish stocking on the primary prey species of fish: aquatic insect species with terrestrial adult forms. These include mayflies (*Ephemeroptera*), stoneflies (*Plecoptera*), caddisflies (*Trichoptera*), and midges (*Diptera*). These species are considered to be primary prey because they are large, mobile, and most exposed to predation. Other macroinvertebrate species, such as snails and fingernail clams (mollusca), flatworms (*Platyhelminthes*), and nematodes frequent less exposed habitats and are less likely to be targeted by fish as prey. Populations of primary macroinvertebrate prey (*Diptera, Ephemeroptera, Trichoptera, Plecoptera*) are considered to exist at the drainage basin scale, due to the dispersal potential from individual lakes and streams (Bilton et al. 2001). Other species of macroinvertebrates, including terrestrial insects, snails, and nematodes, are generally minor prey species and not sensitive to predation at the population level but can be influenced by indirect effects on food web dynamics. The primary prey species are relatively resilient to fish predation at the population level in lake environments, with the exception of specific sensitive species such as phantom midges (*Chaoborus* spp.), which are highly sensitive to fish predation and can be extirpated by even low stocking densities. This is not an issue of concern, however, because the temperature regime in high-mountain lakes in the North Cascades Complex is too cold to support these sensitive species (Verschuren and Marnell 1997).

Fish predation may result in significant changes in abundance and biomass of some macroinvertebrates, as well as behavioral and phenotypical changes (Chess et al. 1993; Knapp 1996; Luecke 1990; Walters and Vincent 1973). Because population boundaries usually extend beyond individual lakes, these effects are limited to the segments of the population exposed to fish predation. While some population segments may be depressed or even temporarily extirpated from a given lake environment, the affected species are usually capable of recolonizing these habitats quickly because they have high dispersal rates (Bilton et al. 2001; Bohonak and Jenkins 2003).

Recent studies by NPS staff of the biological integrity of benthic macroinvertebrate (BMI) communities in 32 lakes have substantially improved the identification of factors contributing to changes in the community. Primary predictive factors identified include, among others, fish density, reproductive status of the fish, quality of the bottom habitat, and area of the lake. Major changes to the benthic macroinvertebrate communities in the 32 lakes studied were associated with a loss of over 40% of the expected taxa in a lake. Other lakes containing high densities of reproducing fish also showed major changes in macroinvertebrate communities (density and/or diversity), although those lakes that contained substantial refuge habitat showed a lessened effect (NPS, R. Glesne, pers. comm., 2004).

Based on the factors identified in the NPS BMI monitoring results, and actual monitoring data from several of the study area lakes, the following impact thresholds were defined for macroinvertebrates (to be applied on a lake-by-lake basis):

Major: Major impacts include the absence of more than 40% of taxa expected to commonly occur in fishless lakes of similar environmental characteristics. Additionally, significant changes in dominant taxa and functional feeding group composition would also occur. Recolonization might not occur for an extended period of time without active intervention. Of the 91 lakes where the benthic community has not been studied, major impacts would be expected where the following predictive factors are present:

- Fish density is high (stocked trout at >100 fish/acre or reproducing trout at >50 fish/acre), and
- Lake area is <10 acres, often with limited habitat complexity.

Moderate: Moderate changes in community structure and functional group composition in a lake would potentially occur, relative to currently fishless but otherwise similar lakes. Populations eventually would recover from impacts if fish were removed. For lakes where the benthic community has not been studied, moderate impacts would be expected when the following predictive factors are present:

- Fish density is high (stocked trout at >100 fish/acre or reproducing trout at >50 fish/acre), and
- Lake area is more than 10 acres or lake area is less than or equal to (”) 10 acres with high habitat complexity.

Minor: Minor changes in community structure in a lake would potentially occur, although populations would recover if fish were removed. For lakes where the benthic community has not been investigated, minor impacts would be expected where the following predictive factor is present:

- Fish density is low (stocked trout at <100 fish/acre).

Negligible: Community structure would be comparable to fishless lakes with similar physical/chemical characteristics. Abundance and community structure would be predominantly influenced by biogeographical and evolutionary processes. Negligible impacts to the macroinvertebrate community would be expected in a lake that was previously stocked but is currently fishless.

Table G-2 (located at the back of this appendix) provides the analysis matrix used for the assessment of impacts, by alternative, on macroinvertebrates for each of the 91 lakes in the study area.

AMPHIBIANS

The amphibian community in mountain lakes is represented by a range of species that includes salamanders, newts, frogs, and toads. The aquatic amphibian community found in the study area consists of two subspecies of long-toed salamander (*Ambystoma macrodactylum macrodactylum* and *A. m. columbianum*), Northwestern salamander (*A. gracile*), rough-skinned newt (*Taricha granulosa*), Columbia spotted frog (*Rana luteiventris*), western toad (*Bufo boreas*), tailed frog (*Ascaphus truei*), and northern red-legged frog (*Rana aurora*). The latter four are listed species and are addressed in the "Affected Environment" chapter under the "Special Status Species" section of this plan/EIS. Due to their sensitivity to stocked trout, the long-toed salamander and Northwestern salamander were selected as the focus of the analysis of impacts on amphibians.

Amphibians are both directly and indirectly impacted by the presence of stocked fish populations in mountain lakes. Direct impacts include predation and competition for prey. Indirect impacts include changes in prey availability resulting from changes in food web dynamics and nutrient cycling attributable to fish introductions in historically fishless lakes. Direct and indirect impacts of the proposed alternatives on amphibians are evaluated at the population level for each amphibian species.

The potential for adverse impacts on the salamander species varies with a number of factors, including the habitat requirements of each species, physical and chemical lake characteristics, the type (that is, stocked or reproducing), and density of stocked fish populations. The two species are generally not found in the same spawning and rearing habitats, but adult habitats are similar. In the adult stage, both species use animal burrows for migration and overwintering habitat, which in turn restricts their range to areas with sufficient soil depth for burrowing mammals (Semlitsch 1983). The differences in habitat preference and tendency for competition between the two species influence the extent of impacts from stocked trout on each species.

Northwestern salamanders are restricted to the west side of the Cascade Crest and require dense, closed-canopy forest during their terrestrial adult phase and downed woody debris in the nearshore areas of ponds and lakes for spawning substrate (Hoffman et al. 2003; Dvornich et al. 1997; Aubry and Hall 1991; Petranka 1998). Dense old-growth forest habitat is particularly important to hibernating adults in the Cascade Mountains from Mount Hood, north (Aubry and Hall 1991). Because this species requires a long juvenile rearing stage of at least two years, and often reaches maturity in aquatic form, spawning and juvenile rearing habitat must be perennial. Because of this range of habitat preferences, suitable lakes and pods for Northwestern salamanders are usually large and deep and typically found below the treeline. The available evidence indicates that when in their preferred habitat, Northwestern salamanders usually dominate and out-compete long-toed salamanders to the point of exclusion (Hoffman et al. 2003; Hoffman 2003; Hoffman and Larson 1999). Trout populations have been documented to reduce the numbers of larvae and neotenic adults (adults that retain some juvenile characteristics) of Northwestern salamanders in individual lakes. However, populations of Northwestern salamanders are likely to coexist with stocked trout and remain viable, albeit at reduced densities. This is likely due to the large size of older larvae and neotenic adults in this species (relative to long-toed salamanders), and a stronger propensity for behavioral adaptations for avoiding predation.

Because long-toed salamanders do not compete well with Northwestern salamanders in perennial bodies of water on the west side of the North Cascades, this species is usually found in lakes in open terrain above the treeline where its competitor is not present. However, these lake habitats will be within a relatively short distance of forested terrestrial habitat for adult salamanders. Lakes above the treeline lack the woody structure and debris required by Northwestern salamanders as spawning substrate. Long-toed salamander breeding sites on the east side of the Cascade Crest are still usually located in areas of open vegetation within a relatively short distance of forested terrestrial habitat, but they are more likely to occur in forested regions below treeline because Northwestern salamanders do not occur in this region. Long-toed salamanders are generally more sensitive to competition and predation by stocked trout and, therefore, are more likely to suffer adverse impacts.

Three predictive factors appear to influence the extent of impacts: the productivity of the rearing lakes (as measured by total Kjeldahl nitrogen, or TKN), the density of stocked trout populations, and the Index of Connectivity (IOC). Based on available evidence, long-toed salamanders are at highest risk of extirpation in low-productivity lakes (TKN values <0.045 mg/l) with high-density populations of reproducing fish (>50 fish/acre), or high-density populations of stocked fish (>100 fish/acre) (Liss et al. 1995, 1999, 2002). A lower potential for extirpation exists in high-productivity lakes (TKN values greater than or equal to [•] 0.045 mg/l) with high-density fish populations. Lakes with low-density fish populations of stocked trout

(”100 fish/acre) do not appear to be at risk of extirpation, but the density of rearing salamander larvae may be reduced.

A final factor to explain the variability of impacts from stocked trout on long-toed salamander larvae in lakes with otherwise suitable habitats is the IOC. The IOC was based on the density or number of potential long-toed salamander breeding ponds or lakes (lakes with suitable aquatic and terrestrial habitat) within a target lake's basin (lakes/mile), number of known long-toed salamander populations within a radius of 3.75 miles (maximum likely colonization distance) of the target lake or pond, and the number of potential long-toed salamander breeding ponds or lakes within a 0.4-mile radius (maximum likely dispersal distance) of the target lake. These values were used to calculate the IOC, which represents the level of gene flow likely to occur between lake populations, likelihood of colonization events, and degree of isolation of a lake from the long-toed salamander metapopulation. IOC cannot exceed a value of 1.0, but it can be below a value of 0. Lakes with an IOC below 0 are considered to have very low potential for colonization or recolonization events in the short term and low levels of genetic interchange. The higher the IOC, the higher the connectivity, and the more likely it is that genetic exchange would occur.

Based on the above information and the knowledge of the plan/EIS team experts about the presence of amphibians in study area lakes, the following thresholds were defined (to be applied on a lake-by-lake basis):

Major: Populations of long-toed salamanders would be permanently altered from normal levels and possibly eliminated from a lake, with recolonization unlikely. For the impact assessment, potentially major impacts to long-toed salamanders would be expected where the following predictive factors are present:

- Lake with suitable habitat (open terrain at the lake with forest nearby) is within the range of the long-toed salamander, and
- TKN is •0.045 mg/L, fish density is high, and IOC is less than 0;

OR

- Lake with suitable habitat is within their range, and
- TKN is <0.045 mg/L, fish density is high, and IOC is ’0.3.

Major impacts to Northwestern salamanders are unlikely in any lake due to larger larvae than long-toed salamanders and behavioral adaptations for avoiding predation.

Moderate: Populations of long-toed salamanders would be present within their historic range, but density of larvae in a lake would potentially be smaller than in comparable fishless lakes, and populations may be eliminated on a temporary or local basis. Populations would deviate from normal levels. Potentially moderate impacts to long-toed salamanders would be expected where the following predictive factors are present:

- Lake with suitable habitat is within their range, and
- TKN is •0.045 mg/L, fish density is high, and IOC is •0;

OR

- Lake with suitable habitat is within their range, and
- TKN is <0.045 mg/L, fish density is high, and IOC is between 0.4 and 0.6.

Moderate impacts to Northwestern salamanders may occur where a lake with dense, closed-canopy forest habitat is within their range, and fish density is high.

Minor: Populations of long-toed salamanders likely would be present within their historic range, but density of larvae in a lake would potentially be slightly smaller than comparable fishless lakes. Minor impacts to long-toed salamanders would be expected where the following predictive factors are present:

- Lake with suitable habitat is within their range, and
- TKN is •0.045 mg/L, fish density is low, and IOC is ’0.3.

Minor impacts to Northwestern salamanders may occur where a lake with suitable forested habitat is within their range and fish density is low.

Negligible: Populations likely would be present in any lake within their historic range, with larval density close to that of fishless lakes. For the impact assessment, negligible impacts to long-toed salamanders would be expected where the following predictive factors are present:

- Lake with suitable habitat is within their range, and
- TKN is •0.045 mg/L, fish density is low, and IOC is •0.4;

OR

- Lake with suitable habitat is within their range, and
- TKN is <0.045 mg/L and fish density is low;

OR

- Lake with suitable habitat is within their range, and
- TKN is <0.045 mg/L, fish density is high, and IOC is •0.7.

Table G-3 summarizes the outcome of various combinations of the principal predictive factors for impacts on the long-toed salamander larvae.

**TABLE G-3: PRINCIPAL PREDICTIVE FACTORS
FOR IMPACTS ON LONG-TOED SALAMANDER LARVAE**

TKN •0.045 mg/L	Fish Density	Index of Connectivity	Impact Level
Yes	High	<0.0	Major
No	High	<0.0 - 0.3	Major
Yes	High	0.0 - 1.0	Moderate
No	High	0.4 - 0.6	Moderate
Yes	Low	<0.0 - 0.3	Minor
No	High	0.7 - 1.0	Negligible
Yes	Low	0.4 - 1.0	Negligible
No	Low	<0.0 - 1.0	Negligible

Table G-4 (located at the back of this appendix) provides the analysis matrix used for the assessment of impacts, by alternative, on amphibians for each of the 91 lakes in the study area.

NATIVE FISH

Impacts on native salmonids from downstream colonization by nonnative species can occur through competition for resources (such as prey species and spawning gravels), introgression (hybridization between nonnative trout and closely related native trout), and predation on juvenile native trout.

Native fish communities in watersheds below mountain lakes can be affected if salmonids stocked in mountain lakes establish populations in outlet streams. The extent of potential adverse impacts on native fish depends upon the species and strain stocked in a given mountain lake and the native species in the downstream areas of the watershed exposed to colonization. There is incomplete information regarding actual impacts currently occurring, or that could occur, for all 91 lakes under all alternatives; therefore, impact thresholds were developed using predictive factors based on the types of species stocked and the watershed locations (since certain species are native only to either the east or west side of the Cascades). Relevant literature and the professional experience of biologists on the plan/EIS team were used to relate the presence of certain nonnative fish to a likely level of impact. In addition to this predictive approach, actual knowledge of impacts (colonization and/or hybridization) occurring in certain drainages (as provided by WDFW staff involved in the preparation of this plan/EIS) was used to characterize impact levels whenever possible (see "Table G-5: Assessment of Impacts on Native Fish"). After the record of decision on this plan/EIS is made and a monitoring program is implemented, more specific biologically based factors would be developed and used in making future adaptive management decisions that would affect lake stocking.

The predictive factors used in this analysis focus on the potential for colonization and/or hybridization of downstream drainages. Colonization of downstream habitats by stocked mountain lake trout has been widely documented, but colonization success varies by species. For example, brook trout stocked in mountain lakes have successfully transited 80% gradient stream reaches and, in one case, a 60-foot waterfall to colonize tributaries with a gradient as high as a 23%. Downstream colonization over distances up to 68 miles has been documented (Adams et al. 2001). In contrast, Mt. Whitney rainbows and California golden trout have been widely stocked in high-elevation lakes in Washington, but successful colonization of downstream habitats by these species has never been documented in Washington State (WDFW, B. Pfeifer, pers. comm., 2002; WDFW, M. Downen, pers. comm., 2002). Various strains of cutthroat and rainbow trout have also been broadly stocked to high-elevation lakes and have had variable success with colonization of downstream habitats.

Because of the low potential of establishing populations in watersheds below mountain lakes, Ross Lake rainbows, Mt. Whitney rainbows, or California golden trout stocked in mountain lakes are unlikely to adversely affect native salmonids on the west side of the Cascade Crest. Also, the stocking of coastal cutthroat trout in a west-side lake would not create adverse effects, since these species are native to west-side watersheds.

Westslope cutthroat trout, however, are not native to stream basins on the west side of the Cascades and have the potential to compete with native trout, char, and salmon for resources and to hybridize with coastal rainbows and coastal cutthroat trout (WDFW, M. Downen, pers. comm., 2002, 2003). The Twin Lakes strain of westslope cutthroat trout has been widely stocked on the west side of the Cascades, with many reproducing populations established in both mountain lakes and streams. The zone of hybridization is likely to be restricted to reaches of streams where both westslope cutthroat and native trout can reproduce. Westslope cutthroat trout generally reproduce later in the year and in colder water temperatures than coastal cutthroat and rainbow trout, which restricts the potential for introgression. Brook trout cannot hybridize with native rainbow or cutthroat trout, but can compete with native trout for available resources in headwater streams and tributaries (Adams et al. 2001). Brook trout are capable of hybridizing with bull trout, which are currently listed as threatened under the *Endangered Species Act*. A high percentage of the hybrids produced are thought to be sterile, giving the smaller but numerically superior brook trout a competitive advantage. A few lakes in the study area west of the Cascade Crest contain reproducing populations of rainbow trout strains, which are more closely related to native strains of rainbow trout and less likely to impact native trout than westslope cutthroat trout.

In the Lake Chelan / Stehekin River basin, Twin Lakes westslope cutthroat trout are stocked in many of the mountain lakes. Although this strain of westslope cutthroat may not be genetically identical to westslope cutthroats that are native to east-side streams, it is closely related and unlikely to have substantial impacts to native trout. Rainbow trout that were adapted to headwater stream and mountain lake environments (perhaps from Packwood Lake, Washington) were stocked into Rainbow Lake in the 1930s before the establishment of the Washington Game Department (currently the Washington Department of Fish and Wildlife). These stocked trout established a reproducing population of rainbow trout on the east side of the Cascade Crest. Reproducing populations of rainbow trout or populations of cutthroat/rainbow hybrids also exist in approximately three other lakes in the study area east of the Cascade Crest. Stocked rainbow trout have been documented to replace, through competition or hybridization, native populations of westslope cutthroat trout throughout its native range (Behnke 1992).

In general, the greatest threat to native fish in downstream drainages would occur from the presence of reproducing brook trout in a west-side lake with outlets to streams containing native char, or from rainbow or rainbow/cutthroat hybrids in an east-side lake, where native westslope cutthroat trout could occur in downstream reaches. These impacts would be considered major if both colonization and hybridization occur as a result of downstream dispersal.

Based on the above information, including the knowledge of WDFW biologists familiar with streams in the study area, the following impact thresholds were defined for native fish populations (to be applied on a lake-by-lake basis):

Major: There would be measurable evidence of colonization, and where interbreeding is possible, hybridization with native fish. Native species deviate from normal population levels or abundance, and/or genotypes are permanently altered. On a local basis, native species may be eliminated or become hybrid swarms. For this assessment, potentially major impacts would be expected when a surface outlet connects to a downstream basin AND the following additional predictive factors are found:

- Inventories demonstrate colonization and hybridization of the outlet stream from downstream dispersal of nonnative stocked fish has occurred,

AND

- Reproducing brook trout are present in a west-side lake, or
- Reproducing rainbow trout or rainbow/cutthroat hybrids are present in an east-side lake.

Moderate: Although individuals of nonnative species stocked into a lake could occasionally disperse downstream and rear in streams, there would be no measurable evidence of colonization or hybridization with native fish. All native species would be indefinitely viable. For this assessment, potentially moderate impacts would be expected when a surface outlet connects to a downstream basin AND the following additional predictive factors are found:

- Inventories demonstrate that colonization and/or hybridization of the outlet stream has not occurred from populations of nonnative stocked fish that have a long history of high levels of reproduction,

AND

- Reproducing brook trout are present in a west-side lake, or

- Reproducing rainbow trout or rainbow/cutthroat hybrids are present in an east-side lake.

Minor: Relatively small numbers of individuals could potentially be affected through intraspecies hybridization. Outbreeding depression may occur in vicinity of outlet stream, but effects would be localized. All native species would be indefinitely viable. For this assessment, potentially minor impacts would be expected when a surface outlet connects to a downstream basin AND one of the following additional predictive factors is found:

- Reproducing strains or subspecies of rainbow or cutthroat trout not native to the basin are present in a west-side lake,

OR

- Mt. Whitney rainbow trout are stocked in an east-side lake.

Negligible: If present in a lake with an outlet, fish are either native to the basin or are unlikely to colonize downstream areas if one or more of the following predictive factors applies:

- Ross Lake or Mt. Whitney rainbow trout, coastal cutthroat trout, or California golden trout are present in a west-side lake,

OR

- Westslope cutthroat trout are present in an east-side lake,

OR

- The lake is fishless.

Lake Name	NPS Lake Code	Zone	E	Level of Impact rnative A	Alternative B	Alternative C	Alternative D
Azure	MP-09-01	W		ible	Negligible	Negligible	Negligible
Battalion	MLY-02-01	E		ate	Negligible	Negligible	Negligible
Bear[a]	MC-12-01	W			Minor	Negligible	Negligible
Berdeen[a]	M-08-01	W			Minor	Negligible	Negligible
Berdeen, Lower	M-07-01	W		ate	Negligible	Negligible	Negligible
Berdeen, Upper	M-09-01	W		ate	Negligible	Negligible	Negligible
Blum (Largest/Middle, No. 3)	M-11-01	W		ate	Negligible	Negligible	Negligible
Blum (Lower/West, No. 4)	LS-07-01	W			Minor	Negligible	Negligible
Blum (Small/North, No. 2)	MC-01-01	W		ible	Negligible	Negligible	Negligible
Blum (Vista/Northwest, No. 1)	MC-02-01	W		ible	Negligible	Negligible	Negligible
Bouck, Lower	DD-04-01	W			Minor	Minor	Negligible
Bouck, Upper	DD-05-01	W			Negligible	Negligible	Negligible
Bowen	MR-12-01	E			Negligible	Negligible	Negligible
Coon	MM-10-01	E			Minor	Minor	Negligible
Copper[b]	MC-06-01	W			Negligible	Negligible	Negligible
Dagger	MR-04-01	E		ate	Negligible	Negligible	Negligible
Dee Dee, Upper	MR-15-01	E			Negligible	Negligible	Negligible
Dee Dee/Tamarack, Lower	MR-15-02	E			Negligible	Negligible	Negligible
Despair, Lower	M-14-01	W		ible	Negligible	Negligible	Negligible
Despair, Upper	M-13-01	W		ible	Negligible	Negligible	Negligible
Diobsud No. 1	LS-01-01	W		ate	Negligible	Negligible	Negligible
Diobsud No. 2, Lower	LS-02-01	W		ate	Negligible	Negligible	Negligible
Diobsud No. 3, Upper	LS-03-01	W			Negligible	Negligible	Negligible
Doubtful	CP-01-01	E			Minor	Negligible	Negligible
Doug's Tarn	M-21-01	W		ate	Minor	Negligible	Negligible
East, Lower	MC-14-02	W		ible	Negligible	Negligible	Negligible
East, Upper	MC-14-01	W		ible	Negligible	Negligible	Negligible
Firn	MP-02-01	W			Minor	Negligible	Negligible
Green[a]	M-04-01	W			Negligible	Negligible	Negligible
Green Bench	LS-04-01	W		ible	Negligible	Negligible	Negligible
Hanging[a,c]	MC-08-01	W			Negligible	Negligible	Negligible
Hidden[a]	SB-01-01	W			Minor	Negligible	Negligible
Hidden Lake Tarn	EP-14-01	W			Negligible	Negligible	Negligible
Hi-Yu	M-01-01	W			Negligible	Negligible	Negligible
Hozomeen[a]	HM-02-01	W			Negligible	Negligible	Negligible
Ipsoot	LS-06-01	W	4		Minor	Negligible	Negligible
Jeanita	DD-01-01	W	4		Minor	Negligible	Negligible
Kettling	MR-05-01	E		ate	Negligible	Negligible	Negligible
Kwahnesum	MC-07-01	W			Negligible	Negligible	Negligible
McAlester	MR-10-01	E		ate	Negligible	Negligible	Negligible
Middle, Lower	MC-16-02	W		ible	Negligible	Negligible	Negligible
Middle, Upper	MC-16-01	W		ible	Negligible	Negligible	Negligible
Monogram[a]	M-23-01	W	4		Minor	Negligible	Negligible
Monogram Tarn	M-23-11	W	4		Negligible	Negligible	Negligible
Nert	M-05-01	W	4		Negligible	Negligible	Negligible

TABLE G-1: ASSESSMENT OF IMPACTS ON PLANKTON

										Management Action Fish Densities				Level of Impact			
Lake Name	NPS Lake Code	Zone	Elevation (ft)	Surface Area (acres)	Maximum Depth (ft)	Water Temp (°C)	Fish Status	Fish Density	Reproducing Trout	Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Azure	MP-09-01	W	4,055	91.6	344.5	8.5	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Battalion	MLY-02-01	E	5,340	6.3	15.6	12.2	M	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Bear[a]	MC-12-01	W	5,795	25.7	151.9	11.4	R	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Berdeen[a]	M-08-01	W	5,000	126.7	215.0	9.3	M	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Berdeen, Lower	M-07-01	W	4,460	7.5	36.1	9.7	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Berdeen, Upper	M-09-01	W	5,050	9.5	—	—	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Blum (Largest/Middle, No. 3)	M-11-01	W	5,030	12.9	—	11.0	M	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Blum (Lower/West, No. 4)	LS-07-01	W	4,940	6.4	25.9	12.9	R	VH	Y	Fish-high density	Fish-low density	Fishless	Fishless	Major	Minor	Negligible	Negligible
8lum (Small/North, No. 2)	MC-01-01	W	5,620	0.9	10.0	19.5	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
8lum (Vista/Northwest, No. 1)	MC-02-01	W	5,900	2.7	35.0	11.0	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
8ouck, Lower	DD-04-01	W	3,850	10.8	63.2	11.2	R	H	Y	Fish-high density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
8ouck, Upper	DD-05-01	W	5,030	5.5	29.0	10.5	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Bowen	MR-12-01	E	6,495	1.5	13.1	—	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Coon	MM-10-01	E	2,172	11.3	19.0	16.6	S	L	N	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Copper[b]	MC-06-01	W	5,263	12.9	67.2	10.3	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Dagger	MR-04-01	E	5,50B	8.2	15.9	12.3	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Dee Dee, Upper	MR-15-01	E	6,303	12.2	B9.2	7.4	M	H	Y	Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Dee Dee/Tamarack, Lower	MR-15-02	E	6,260	0.8	9.8	7.1	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Despair, Lower	M-14-01	W	4,820	1.7	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Despair, Upper	M-13-01	W	5,100	2.1	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Diobsud No. 1	LS-01-01	W	4,220	1.0	11.2	14.1	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Diobsud No. 2, Lower	LS-02-01	W	4,220	3.1	17.2	13.7	M	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Diobsud No. 3, Upper	LS-03-01	W	4,420	3.9	17.1	14.B	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Doubtful	CP-01-01	E	5,385	30.2	68.2	10.9	R	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Doug's Tarn	M-21-01	W	3,951	5.0	10.2	11.2	R	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
East, Lower	MC-14-02	W	5,460	8.0	—	15.6	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
East, Upper	MC-14-01	W	5,595	6.2	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Firn	MP-02-01	W	5,472	5.7	37.7	12.6	M	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Green[a]	M-04-01	W	4,261	80.0	153.2	8.7	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Green Bench	LS-04-01	W	4,870	3.9	21.5	10.5	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Hanging[a,c]	MC-0B-01	W	4,522	88.8	—	—	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Hidden[a]	SB-01-01	W	5,733	61.7	258.2	7.2	M	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Hidden Lake Tarn	EP-14-01	W	5,830	4.9	42.7	12.B	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Hi-Yu	M-01-01	W	3,830	3.6	18.0	16.4	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Hozomeen[a]	HM-02-01	W	2,823	97.4	66.7	17.4	R	VH	Y	Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Ipsoot	LS-06-01	W	4,460	8.9	50.8	19.7	R	L	Y	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Jeanita	DD-01-01	W	4,904	1.4	8.0	12.7	R	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Kettling	MR-05-01	E	5,375	9.9	23.0	11.4	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Kwahnesum	MC-07-01	W	5,102	16.4	104.3	12.3	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
McAlester	MR-10-01	E	5,507	13.2	23.0	13.0	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Middle, Lower	MC-16-02	W	5,595	2.9	B.0	7.9	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Middle, Upper	MC-16-01	W	5,700	4.5	25.9	3.4	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Monogram[a]	M-23-01	W	4,873	29.1	122.0	12.3	M	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Monogram Tarn	M-23-11	W	4,860	—	—	—	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Nert	M-05-01	W	4,556	3.6	29.5	15.B	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible

				Level of Impact			
Lake Name	NPS Lake Code	Zone	El	native A	Alternative B	Alternative C	Alternative D
Noisy Creek, Upper	LS-14-01	W		ble	Negligible	Negligible	Negligible
No Name	PM-01-01	W			Minor	Negligible	Negligible
Panther Potholes, Lower	RD-05-02	W			Negligible	Negligible	Negligible
Panther Potholes, Upper	RD-05-01	W		ble	Negligible	Negligible	Negligible
Pegasus	EP-10-01	W		ble	Negligible	Negligible	Negligible
Pond SE of Kettling Lakes	MR-09-01	E			Minor	Minor	Negligible
Quill, Lower	M-24-02	W			Negligible	Negligible	Negligible
Quill, Upper	M-24-01	W			Negligible	Negligible	Negligible
Rainbow	MR-14-01	E			Minor	Minor	Negligible
Rainbow, Upper (North)	MR-13-01	E		ble	Negligible	Negligible	Negligible
Rainbow, Upper (South)	MR-13-02	E			Negligible	Negligible	Negligible
Rainbow, Upper (West)	MM-11-01	E			Negligible	Negligible	Negligible
Redoubt	MC-11-01	W		ble	Negligible	Negligible	Negligible
Reveille, Lower	MC-21-02	W		ble	Negligible	Negligible	Negligible
Reveille, Upper	MC-21-01	W		ble	Negligible	Negligible	Negligible
Ridley	HM-03-01	W			Minor	Minor	Negligible
Sky	EP-13-01	W		ble	Negligible	Negligible	Negligible
Skymo	PM-03-01	W		ate	Minor	Negligible	Negligible
Sourdough	PM-12-01	W			Negligible	Negligible	Negligible
Sourpuss	ML-01-01	W		ble	Negligible	Negligible	Negligible
Stiletto	MR-01-01	E			Negligible	Negligible	Negligible
Stout[a]	EP-09-02	W			Minor	Negligible	Negligible
Stout, Lower	EP-09-01	W			Minor	Negligible	Negligible
Sweet Pea	ML-02-01	W			Minor	Negligible	Negligible
Talus Tarn	M-06-01	W		ble	Negligible	Negligible	Negligible
Tapto, Lower	MC-17-03	W		ble	Negligible	Negligible	Negligible
Tapto, Middle	MC-17-02	W		ble	Negligible	Negligible	Negligible
Tapto, Upper	MC-17-01	W		ble	Negligible	Negligible	Negligible
Tapto, West	MC-17-04	W		ble	Negligible	Negligible	Negligible
Thornton, Lower	M-20-01	W			Minor	Negligible	Negligible
Thornton, Middle	M-19-01	W			Minor	Negligible	Negligible
Thunder	RD-02-01	W		ble	Negligible	Negligible	Negligible
Tiny	MC-15-01	W		ble	Negligible	Negligible	Negligible
Torment	ML-03-01	W			Negligible	Negligible	Negligible
Trapper[a]	GM-01-01	E			Minor	Negligible	Negligible
Triplet, Lower	SM-02-01	E		ate	Minor	Minor	Negligible
Triplet, Upper	SM-02-02	E		ate	Negligible	Negligible	Negligible
Triumph	M-17-01	W			Minor	Negligible	Negligible
Unnamed	FP-01-01	W		ble	Negligible	Negligible	Negligible
Unnamed	MR-11-01	E			Minor	Minor	Negligible
Unnamed	MR-16-01	E			Minor	Minor	Negligible
Vulcan	ML-04-01	W		ble	Negligible	Negligible	Negligible
Wilcox/Lillie, Upper	EP-06-01	W			Negligible	Negligible	Negligible
Wilcox/Sandie, Lower	EP-05-01	W		ate	Minor	Negligible	Negligible
Wild	MC-27-01	W		ble	Negligible	Negligible	Negligible
Willow	HM-04-01	W			Minor	Minor	Negligible

TABLE G-1: ASSESSMENT OF IMPACTS ON PLANKTON (CONTINUED)

Lake Name	NPS Lake Code	Zone	Elevation (ft)	Surface Area (acres)	Maximum Depth (ft)	Water Temp (°C)	Fish Status	Fish Density	Reproducing Trout	Management Action Fish Densities				Level of Impact			
										Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Noisy Creek, Upper	LS-14-01	W	3,660	0.3	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
No Name	PM-01-01	W	3,843	7.5	31.2	7.6	S	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Panther Potholes, Lower	RD-05-02	W	3,375	0.5	17.2	17.4	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Panther Potholes, Upper	RD-05-01	W	3,380	0.2	9.4	17.8	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Pegasus	EP-10-01	W	5,620	10.9	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Pond SE of Kettling Lakes	MR-09-01	E	5,945	4.7	16.1	—	S	L	N	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Quill, Lower	M-24-02	W	4,510	1.0	18.0		S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Quill, Upper	M-24-01	W	4,510	1.2	10.0	20.0	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Rainbow	MR-14-01	E	5,630	15.5	107.6	13.1	R	H	Y	Fish-high density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Rainbow, Upper (North)	MR-13-01	E	5,900	0.6	7.2	15.7	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Rainbow, Upper (South)	MR-13-02	E	5,865	3.6	24.1	10.6	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Rainbow, Upper (West)	MM-11-01	E	6,473	3.5	27.6	13.4	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Redoubt	MC-11-01	W	5,300	18.4	45.9	9.3	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Reveille, Lower	MC-21-02	W	4,995	4.4	9.8	13.8	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Reveille, Upper	MC-21-01	W	4,995	3.4	16.4	8.0	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ridley	HM-03-01	W	3,140	10.9	35.1	18.2	S	L	N	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Sky	EP-13-01	W	5,380	1.9	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skymo	PM-03-01	W	5,277	10.8	20.0	11.1	M	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Sourdough	PM-12-01	W	4,623	27.6	107.0	14.7	M	VH	Y	Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Sourpuss	ML-01-01	W	4,835	2.0	3.9	7.8	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stiletto	MR-01-01	E	6,795	9.9	85.3	6.1	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Stout[a]	EP-09-02	W	5,215	25.2	175.5	5.4	M	L	Y	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Stout, Lower	EP-09-01	W	5,190	1.0	8.2	13.2	R	L	Y	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Sweet Pea	ML-02-01	W	5,540	10.3	92.0	6.5	S	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Talus Tarn	M-06-01	W	5,355	1.5	11.8	11.7	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Lower	MC-17-03	W	5,700	0.4	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Middle	MC-17-02	W	5,730	1.2	18.0	12.9	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Upper	MC-17-01	W	5,750	10.2	43.0	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, West	MC-17-04	W	5,660	2.3	14.1	11.7	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Thornton, Lower	M-20-01	W	4,486	55.1	108.3	12.2	M	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Thornton, Middle	M-19-01	W	4,700	11.9	78.7	8.2	S	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Thunder	RD-02-01	W	1,350	6.8	24.6	15.3	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tiny	MC-15-01	W	6,100	0.3	6.0	17.0	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Torment	ML-03-01	W	6,560	3.6	49.9	8.0	S	L	N	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Trapper[a]	GM-01-01	E	4,165	147.2	160.8	14.1	R	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Triplet, Lower	SM-02-01	E	6,331	2.2	7.2	17.5	R	H	Y	Fish-high density	Fish-low density	Fish-low density	Fishless	Moderate	Minor	Minor	Negligible
Triplet, Upper	SM-02-02	E	6,551	2.3	12.5	19.7	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Triumph	M-17-01	W	3,685	4.3	20.5	17.1	S	L	N	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Unnamed	FP-01-01	W	5,140	13.5	—	—	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Unnamed	MR-11-01	E	6,111	2.9	28.9	14.6	S	L	N	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Unnamed	MR-16-01	E	6,230	1.9	6.6	—	R	L	N	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Vulcan	ML-04-01	W	5,180	8.2	25.2	10.7	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Wilcox/Lillie, Upper	EP-06-01	W	5,136	10.5	65.0	14.5	R	H	Y	Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Wilcox/Sandie, Lower	EP-05-01	W	5,120	5.4	19.7	13.5	R	H	Y	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Wild	MC-27-01	W	4,880	12.7	28.9	10.1	FL	N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Willow	HM-04-01	W	2,853	16.9	26.9	19.5	S	L	N	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible

Notes:

Zone: E = East side of Cascade Crest
W = West side of Cascade Crest

Fish Status: S = Stocked
S* = Stocked with reproducing fish.
R = Reproducing
M = Mixed reproducing and stocked
NF = No fish (historically stocked)
FL = No fish (historically fishless)

Fish Density: H = High fish density (> 100 trout/ac
L = Low fish density (< 100 trout/acr
N = No fish present
VH = Very High fish density (> 400 t

Reproducing Trout: N = No
Y = Yes

Management Action Fish Densities:

Level of Impact:

For impact thresholds, refer to "Table 31: Summary of

a. The feasibility of complete removal of fish in these lakes

b In August 2004, a large fish kill was observed in Copper L

c. Remove all reproducing fish from Hanging Lake pending

TABLE G-1: ASSESSMENT OF IMPACTS ON PLANKTON (CONTINUED)

Notes:

Zone: E = East side of Cascade Crest
W = West side of Cascade Crest

Fish Status: S = Stocked
S* = Stocked with reproducing fish. Limited reproduction in the past – needs verification.
R = Reproducing
M = Mixed reproducing and stocked
NF = No fish (historically stocked)
FL = No fish (historically fishless)

Fish Density: H = High fish density (> 100 trout/acre for stocked fish or > 50 trout/acre for reproducing fish)
L = Low fish density (< 100 trout/acre for stocked fish or < 50 trout/acre for reproducing fish)
N = No fish present
VH = Very High fish density (> 400 trout/acre of reproducing fish or stocked fish with multiple year-classes approximating age structure of reproducing fish)

Reproducing Trout: N = No
Y = Yes

Management Action Fish Densities:

Level of Impact:

For impact thresholds, refer to "Table 31: Summary of Impact Thresholds—Aquatic Organisms" in the "Environmental Consequences" chapter.

a The feasibility of complete removal of fish in these lakes would need to be evaluated.

b In August 2004, a large fish kill was observed in Copper Lake, possibly due to disease. Further surveys are needed to confirm that the lake is fishless.

c Remove all reproducing fish from Hanging Lake pending agreement with British Columbia.

			E	Level of Impact		
Lake Name	NPS Lake Code	Zone	e A	Alternative B	Alternative C	Alternative D
Azure	MP-09-01	W		Negligible	Negligible	Negligible
Battalion	MLY-02-01	E		Negligible	Negligible	Negligible
Bear[a]	MC-12-01	W		Minor	Negligible	Negligible
Berdeen[a]	M-08-01	W		Minor	Negligible	Negligible
Berdeen, Lower	M-07-01	W		Negligible	Negligible	Negligible
Berdeen, Upper	M-09-01	W		Negligible	Negligible	Negligible
Blum (Largest/Middle, No. 3)	M-11-01	W		Negligible	Negligible	Negligible
Blum (Lower/West, No. 4)	LS-07-01	W		Minor	Negligible	Negligible
Blum (Small/North, No. 2)	MC-01-01	W		Negligible	Negligible	Negligible
Blum (Vista/Northwest, No. 1)	MC-02-01	W		Negligible	Negligible	Negligible
Bouck, Lower	DD-04-01	W		Minor	Minor	Negligible
Bouck, Upper	DD-05-01	W		Negligible	Negligible	Negligible
Bowan	MR-12-01	E		Negligible	Negligible	Negligible
Coon	MM-10-01	E		Minor	Minor	Negligible
Copper[b]	MC-06-01	W		Negligible	Negligible	Negligible
Dagger	MR-04-01	E		Negligible	Negligible	Negligible
Dee Dee, Upper	MR-15-01	E		Negligible	Negligible	Negligible
Dee Dee/Tamarack, Lower	MR-15-02	E		Negligible	Negligible	Negligible
Despair, Lower	M-14-01	W		Negligible	Negligible	Negligible
Despair, Upper	M-13-01	W		Negligible	Negligible	Negligible
Diobsud No. 1	LS-01-01	W		Negligible	Negligible	Negligible
Diobsud No. 2, Lower	LS-02-01	W		Negligible	Negligible	Negligible
Diobsud No. 3, Upper	LS-03-01	W		Negligible	Negligible	Negligible
Doubtful	CP-01-01	E		Minor	Negligible	Negligible
Doug's Tarn	M-21-01	W		Minor	Negligible	Negligible
East, Lower	MC-14-02	W		Negligible	Negligible	Negligible
East, Upper	MC-14-01	W		Negligible	Negligible	Negligible
Firn	MP-02-01	W		Minor	Negligible	Negligible
Green[a]	M-04-01	W		Negligible	Negligible	Negligible
Green Bench	LS-04-01	W		Negligible	Negligible	Negligible
Hanging[a,c]	MC-08-01	W		Negligible	Negligible	Negligible
Hidden[a]	SB-01-01	W		Minor	Negligible	Negligible
Hidden Lake Tarn	EP-14-01	W		Negligible	Negligible	Negligible
Hi-Yu	M-01-01	W		Negligible	Negligible	Negligible
Hozomeen[a]	HM-02-01	W		Negligible	Negligible	Negligible
Ipsoot	LS-06-01	W		Minor	Negligible	Negligible
Jeanita	DD-01-01	W		Minor	Negligible	Negligible
Kettling	MR-05-01	E		Negligible	Negligible	Negligible
Kwahnesum	MC-07-01	W		Negligible	Negligible	Negligible
McAlester	MR-10-01	E		Negligible	Negligible	Negligible
Middle, Lower	MC-16-02	W		Negligible	Negligible	Negligible
Middle, Upper	MC-16-01	W		Negligible	Negligible	Negligible

TABLE G-2: ASSESSMENT OF IMPACTS ON MACROINVERTEBRATES

									Management Action Fish Densities				Level of Impact			
Lake Name	NPS Lake Code	Zone	Elevation (ft)	Surface Area (acres)	Max. Depth (ft)	Water Temp (°C)	Fish Status	Fish Density	Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Azure	MP-09-01	W	4,055	91.6	344.5	8.5	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Battalion	MLY-02-01	E	5,340	6.3	15.6	12.2	M	H	Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Bear[a]	MC-12-01	W	5,795	25.7	151.9	11.4	R	H	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Berdeen[a]	M-08-01	W	5,000	126.7	215.0	9.3	M	H	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Berdeen, Lower	M-07-01	W	4,460	7.5	36.1	9.7	R	H	Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Berdeen, Upper	M-09-01	W	5,050	9.5	—	—	R	H	Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Blum (Largest/Middle, No. 3)	M-11-01	W	5,030	12.9	—	11.0	M	H	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Blum (Lower/West, No. 4)	LS-07-01	W	4,940	6.4	25.9	12.9	R	VH	Fish-high density	Fish-low density	Fishless	Fishless	Major	Minor	Negligible	Negligible
Blum (Small/North, No. 2)	MC-01-01	W	5,620	0.9	10.0	19.5	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Blum (Vista/Northwest, No. 1)	MC-02-01	W	5,900	2.7	35.0	11.0	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Bouck, Lower	DD-04-01	W	3,850	10.8	63.2	11.2	R	H	Fish-high density	Fish-low density	Fish-low density	Fishless	Moderate	Minor	Minor	Negligible
Bouck, Upper	DD-05-01	W	5,030	5.5	29.0	10.5	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Bowan	MR-12-01	E	6,495	1.5	13.1	—	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Coon	MM-10-01	E	2,172	11.3	19.0	16.6	S	L	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Copper[b]	MC-06-01	W	5,263	12.9	67.2	10.3	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Dagger	MR-04-01	E	5,508	8.2	15.9	12.3	R	H	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Dee Dee, Upper	MR-15-01	E	6,303	12.2	89.2	7.4	M	H	Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Dee Dee/Tamarack, Lower	MR-15-02	E	6,260	0.8	9.8	7.1	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Despair, Lower	M-14-01	W	4,820	1.7	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Despair, Upper	M-13-01	W	5,100	2.1	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Diobsud No. 1	LS-01-01	W	4,220	1.0	11.2	14.1	R	H	Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Diobsud No. 2, Lower	LS-02-01	W	4,220	3.1	17.2	13.7	M	H	Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Diobsud No. 3, Upper	LS-03-01	W	4,420	3.9	17.1	14.8	S	L	Fish-low density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Doubtful	CP-01-01	E	5,385	30.2	68.2	10.9	R	H	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Doug's Tarn	M-21-01	W	3,951	5.0	10.2	11.2	R	H	Fish-high density	Fish-low density	Fishless	Fishless	Major	Minor	Negligible	Negligible
East, Lower	MC-14-02	W	5,460	8.0	—	15.6	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
East, Upper	MC-14-01	W	5,595	6.2	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Firn	MP-02-01	W	5,472	5.7	37.7	12.6	M	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Green[a]	M-04-01	W	4,261	80.0	153.2	8.7	R	H	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Green Bench	LS-04-01	W	4,870	3.9	21.5	10.5	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Hanging[a,c]	MC-08-01	W	4,522	88.8	—	—	R	H	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Hidden[a]	SB-01-01	W	5,733	61.7	258.2	7.2	M	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Hidden Lake Tarn	EP-14-01	W	5,830	4.9	42.7	12.8	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Hi-Yu	M-01-01	W	3,830	3.6	18.0	16.4	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Hozomeen[a]	HM-02-01	W	2,823	97.4	66.7	17.4	R	VH	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Ipsoot	LS-06-01	W	4,460	8.9	50.8	19.7	R	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Jeanita	DD-01-01	W	4,904	1.4	8.0	12.7	R	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Kettling	MR-05-01	E	5,375	9.9	23.0	11.4	R	H	Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Kwahnesum	MC-07-01	W	5,102	16.4	104.3	12.3	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
McAlester	MR-10-01	E	5,507	13.2	23.0	13.0	R	H	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Middle, Lower	MC-16-02	W	5,595	2.9	8.0	7.9	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Middle, Upper	MC-16-01	W	5,700	4.5	25.9	3.4	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible

Lake Name	NPS Lake Code	Zone	Level of Impact			
			ve A	Alternative B	Alternative C	Alternative D
Monogram[a]	M-23-01	W		Minor	Negligible	Negligible
Monogram Tarn	M-23-11	W		Negligible	Negligible	Negligible
Nert	M-05-01	W		Negligible	Negligible	Negligible
Noisy Creek, Upper	LS-14-01	W		Negligible	Negligible	Negligible
No Name	PM-01-01	W		Minor	Negligible	Negligible
Panther Potholes, Lower	RD-05-02	W		Negligible	Negligible	Negligible
Panther Potholes, Upper	RD-05-01	W		Negligible	Negligible	Negligible
Pegasus	EP-10-01	W		Negligible	Negligible	Negligible
Pond SE of Kettling Lakes	MR-09-01	E		Minor	Minor	Negligible
Quill, Lower	M-24-02	W		Negligible	Negligible	Negligible
Quill, Upper	M-24-01	W		Negligible	Negligible	Negligible
Rainbow	MR-14-01	E		Minor	Minor	Negligible
Rainbow, Upper (North)	MR-13-01	E		Negligible	Negligible	Negligible
Rainbow, Upper (South)	MR-13-02	E		Negligible	Negligible	Negligible
Rainbow, Upper (West)	MM-11-01	E		Negligible	Negligible	Negligible
Redoubt	MC-11-01	W		Negligible	Negligible	Negligible
Reveille, Lower	MC-21-02	W		Negligible	Negligible	Negligible
Reveille, Upper	MC-21-01	W		Negligible	Negligible	Negligible
Ridley	HM-03-01	W		Minor	Minor	Negligible
Sky	EP-13-01	W		Negligible	Negligible	Negligible
Skymo	PM-03-01	W		Minor	Negligible	Negligible
Sourdough	PM-12-01	W		Negligible	Negligible	Negligible
Sourpuss	ML-01-01	W		Negligible	Negligible	Negligible
Stiletto	MR-01-01	E		Negligible	Negligible	Negligible
Stout[a]	EP-09-02	W		Minor	Negligible	Negligible
Stout, Lower	EP-09-01	W		Minor	Negligible	Negligible
Sweet Pea	ML-02-01	W		Minor	Negligible	Negligible
Talus Tarn	M-06-01	W		Negligible	Negligible	Negligible
Tapto, Lower	MC-17-03	W		Negligible	Negligible	Negligible
Tapto, Middle	MC-17-02	W		Negligible	Negligible	Negligible
Tapto, Upper	MC-17-01	W		Negligible	Negligible	Negligible
Tapto, West	MC-17-04	W		Negligible	Negligible	Negligible
Thornton, Lower	M-20-01	W		Minor	Negligible	Negligible
Thornton, Middle	M-19-01	W		Minor	Negligible	Negligible
Thunder	RD-02-01	W		Negligible	Negligible	Negligible
Tiny	MC-15-01	W		Negligible	Negligible	Negligible
Torment	ML-03-01	W		Negligible	Negligible	Negligible
Trapper[a]	GM-01-01	E		Minor	Negligible	Negligible
Triplet, Lower	SM-02-01	E		Minor	Minor	Negligible
Triplet, Upper	SM-02-02	E		Negligible	Negligible	Negligible
Triumph	M-17-01	W		Minor	Negligible	Negligible
Unnamed	FP-01-01	W		Negligible	Negligible	Negligible
Unnamed	MR-11-01	E		Minor	Minor	Negligible

TABLE G-2: ASSESSMENT OF IMPACTS ON MACROINVERTEBRATES (CONTINUED)

									Management Action Fish Densities				Level of Impact			
Lake Name	NPS Lake Code	Zone	Elevation (ft)	Surface Area (acres)	Max. Depth (ft)	Water Temp (°C)	Fish Status	Fish Density	Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Monogram[a]	M-23-01	W	4,873	29.1	122.0	12.3	M	H	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Monogram Tarn	M-23-11	W	4,860	—	—	—	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Nert	M-05-01	W	4,556	3.6	29.5	15.8	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Noisy Creek, Upper	LS-14-01	W	3,660	0.3	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
No Name	PM-01-01	W	3,843	7.5	31.2	7.6	S	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Panther Potholes, Lower	RD-05-02	W	3,375	0.5	17.2	17.4	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Panther Potholes, Upper	RD-05-01	W	3,380	0.2	9.4	17.8	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Pegasus	EP-10-01	W	5,620	10.9	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Pond SE of Kettling Lakes	MR-09-01	E	5,945	4.7	16.1	—	S	L	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Quill, Lower	M-24-02	W	4,510	1.0	18.0		S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Quill, Upper	M-24-01	W	4,510	1.2	10.0	20.0	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Rainbow	MR-14-01	E	5,630	15.5	107.6	13.1	R	H	Fish-high density	Fish-low density	Fish-low density	Fishless	Moderate	Minor	Minor	Negligible
Rainbow, Upper (North)	MR-13-01	E	5,900	0.6	7.2	15.7	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Rainbow, Upper (South)	MR-13-02	E	5,865	3.6	24.1	10.6	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Rainbow, Upper (West)	MM-11-01	E	6,473	3.5	27.6	13.4	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Redoubt	MC-11-01	W	5,300	18.4	45.9	9.3	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Reveille, Lower	MC-21-02	W	4,995	4.4	9.8	13.8	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Reveille, Upper	MC-21-01	W	4,995	3.4	16.4	8.0	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ridley	HM-03-01	W	3,140	10.9	35.1	18.2	S	L	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Sky	EP-13-01	W	5,380	1.9	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skymo	PM-03-01	W	5,277	10.8	20.0	11.1	M	H	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Sourdough	PM-12-01	W	4,623	27.6	107.0	14.7	M	VH	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Sourpuss	ML-01-01	W	4,835	2.0	3.9	7.8	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stiletto	MR-01-01	E	6,795	9.9	85.3	6.1	S	L	Fish-low density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Stout[a]	EP-09-02	W	5,215	25.2	175.5	5.4	M	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Stout, Lower	EP-09-01	W	5,190	1.0	8.2	13.2	R	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Sweet Pea	ML-02-01	W	5,540	10.3	92.0	6.5	S	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Talus Tarn	M-06-01	W	5,355	1.5	11.8	11.7	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Lower	MC-17-03	W	5,700	0.4	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Middle	MC-17-02	W	5,730	1.2	18.0	12.9	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Upper	MC-17-01	W	5,750	10.2	43.0	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, West	MC-17-04	W	5,660	2.3	14.1	11.7	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Thornton, Lower	M-20-01	W	4,486	55.1	108.3	12.2	M	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Thornton, Middle	M-19-01	W	4,700	11.9	78.7	8.2	S	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Thunder	RD-02-01	W	1,350	6.8	24.6	15.3	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tiny	MC-15-01	W	6,100	0.3	6.0	17.0	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Torment	ML-03-01	W	6,560	3.6	49.9	8.0	S	L	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Trapper[a]	GM-01-01	E	4,165	147.2	160.8	14.1	R	H	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Minor	Negligible	Negligible
Triplet, Lower	SM-02-01	E	6,331	2.2	7.2	17.5	R	H	Fish-high density	Fish-low density	Fish-low density	Fishless	Major	Minor	Minor	Negligible
Triplet, Upper	SM-02-02	E	6,551	2.3	12.5	19.7	R	H	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Triumph	M-17-01	W	3,685	4.3	20.5	17.1	S	L	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Unnamed	FP-01-01	W	5,140	13.5	—	—	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Unnamed	MR-11-01	E	6,111	2.9	28.9	14.6	S	L	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible

			Level of Impact			
Lake Name	NPS Lake Code	Zone	e A	Alternative B	Alternative C	Alternative D
Unnamed	MR-16-01	E		Minor	Minor	Negligible
Vulcan	ML-04-01	W		Negligible	Negligible	Negligible
Wilcox/Lillie, Upper	EP-06-01	W		Negligible	Negligible	Negligible
Wilcox/Sandie, Lower	EP-05-01	W		Minor	Negligible	Negligible
Wild	MC-27-01	W		Negligible	Negligible	Negligible
Willow	HM-04-01	W		Minor	Minor	Negligible

Notes:

Zone:
E = East side of Cascade Crest
W = West side of Cascade Crest

Fish Status:
S = Stocked
S* = Stocked with reproducing fish.
R = Reproducing
M = Mixed reproducing and stocke
NF = No fish (historically stocked)
FL = No fish (historically fishless)

Fish Density:
VH = Very high density of reproduc
H = Reproducing trout at >100 fish/
M = Reproducing population with d
L = Stocked population < 100 fish/a
N = No fish present.

Impacts:

See table 31 for impact thresholds.

a. The feasibility of complete removal of fish in these lake

b. In August 2004, a large fish kill was observed in Coppe

c. Remove all reproducing fish from Hanging Lake pendin

TABLE G-2: ASSESSMENT OF IMPACTS ON MACROINVERTEBRATES E (CONTINUED)

Lake Name	NPS Lake Code	Zone	Elevation (ft)	Surface Area (acres)	Max. Depth (ft)	Water Temp (°C)	Fish Status	Fish Density	Management Action Fish Densities				Level of Impact			
									Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Unnamed	MR-16-01	E	6,230	1.9	6.6	—	R	L	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Vulcan	ML-04-01	W	5,180	8.2	25.2	10.7	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Wilcox/Lillie, Upper	EP-06-01	W	5,136	10.5	65.0	14.5	R	H	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Wilcox/Sandie, Lower	EP-05-01	W	5,120	5.4	19.7	13.5	R	H	Fish-high density	Fish-low density	Fishless	Fishless	Major	Minor	Negligible	Negligible
Wild	MC-27-01	W	4,880	12.7	28.9	10.1	FL	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Willow	HM-04-01	W	2,853	16.9	26.9	19.5	S	L	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible

Notes:

Zone: E = East side of Cascade Crest
W = West side of Cascade Crest

Fish Status: S = Stocked
S* = Stocked with reproducing fish. Limited reproduction in the past – needs verification.
R = Reproducing
M = Mixed reproducing and stocked
NF = No fish (historically stocked)
FL = No fish (historically fishless)

Fish Density: VH = Very high density of reproducing trout (> 220 fish/acre), typically brook trout.
H = Reproducing trout at >100 fish/acre, or reported high density trout population with poor condition index or high reproductive rate.
M = Reproducing population with documented density of 50 to 100 fish/acre or reported reproducing population with good numbers, size, growth, and condition factor.
L = Stocked population < 100 fish/acre or reproducing population < 50 fish.
N = No fish present.

Impacts:
See table 31 for impact thresholds.

a The feasibility of complete removal of fish in these lakes would need to be evaluated.

b. In August 2004, a large fish kill was observed in Copper Lake, possibly due to disease. Further surveys are needed to confirm that the lake is fishless.

c. Remove all reproducing fish from Hanging Lake pending agreement with British Columbia.

Lake Name	NPS Lake Code	Zone	C	Level of Impact		
				Alternative B	Alternative C	Alternative D
Azure	MP-09-01	W		Negligible	Negligible	Negligible
Battalion	MLY-02-01	E		Negligible (1)	Negligible (1)	Negligible
Bear[a]	MC-12-01	W		Negligible	Negligible	Negligible
Berdeen[a]	M-08-01	W		Negligible	Negligible	Negligible
Berdeen, Lower	M-07-01	W		Negligible	Negligible	Negligible
Berdeen, Upper	M-09-01	W		Negligible	Negligible	Negligible
Blum (Largest/Middle, No. 3)	M-11-01	W		Negligible	Negligible	Negligible
Blum (Lower/West, No. 4)	LS-07-01	W		Negligible	Negligible	Negligible
Blum (Small/North, No. 2)	MC-01-01	W		Negligible	Negligible	Negligible
Blum (Vista/Northwest, No. 1)	MC-02-01	W		Negligible	Negligible	Negligible
Bouck, Lower	DD-04-01	W		Minor	Minor	Negligible
Bouck, Upper	DD-05-01	W		Negligible	Negligible	Negligible
Bowan	MR-12-01	E		Negligible	Negligible	Negligible
Coon	MM-10-01	E		Minor	Minor	Negligible
Copper[b]	MC-06-01	W		Negligible	Negligible	Negligible
Dagger	MR-04-01	E		Negligible	Negligible	Negligible
Dee Dee, Upper	MR-15-01	E		Negligible	Negligible	Negligible
Dee Dee/Tamarack, Lower	MR-15-02	E		Negligible	Negligible	Negligible
Despair, Lower	M-14-01	W		Negligible	Negligible	Negligible
Despair, Upper	M-13-01	W		Negligible	Negligible	Negligible
Diobsud No. 1	LS-01-01	W		Negligible	Negligible	Negligible
Diobsud No. 2, Lower	LS-02-01	W		Negligible	Negligible	Negligible
Diobsud No. 3, Upper	LS-03-01	W		Negligible	Negligible	Negligible
Doubtful	CP-01-01	E		Negligible	Negligible	Negligible
Doug's Tarn	M-21-01	W		Negligible	Negligible	Negligible
East, Lower	MC-14-02	W		Negligible	Negligible	Negligible
East, Upper	MC-14-01	W		Negligible	Negligible	Negligible
Firn	MP-02-01	W		Negligible	Negligible	Negligible
Green[a]	M-04-01	W		Negligible	Negligible	Negligible
Green Bench	LS-04-01	W		Negligible	Negligible	Negligible
Hanging[a,c]	MC-08-01	W		Negligible	Negligible	Negligible
Hidden[a]	SB-01-01	W		Negligible	Negligible	Negligible
Hidden Lake Tarn	EP-14-01	W		Negligible	Negligible	Negligible
Hi-Yu	M-01-01	W		Negligible (1)	Negligible	Negligible
Hozomeen[a]	HM-02-01	W		Negligible	Negligible	Negligible
Ipsoot	LS-06-01	W		Minor (1)	Negligible	Negligible
Jeanita	DD-01-01	W		Minor	Negligible	Negligible
Kettling	MR-05-01	E		Negligible	Negligible	Negligible
Kwahnesum	MC-07-01	W		Minor	Negligible	Negligible
McAlester	MR-10-01	E		Negligible	Negligible	Negligible
Middle, Lower	MC-16-02	W		Negligible	Negligible	Negligible

TABLE G-4: ASSESSMENT OF IMPACTS ON AMPHIBIANS

								Management Action Fish Densities				Level of Impact			
Lake Name	NPS Lake Code	Zone	Index of Connectivity	Within Range of Distribution LTS	NWS	Fish Density	TKN ≥ 0.045 mg/L	Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Azure	MP-09-01	W	—	—		N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Battalion	MLY-02-01	E	0.0	X		H	N	Fish-high density	Fishless	Fishless	Fishless	Major (1)	Negligible (1)	Negligible (1)	Negligible
Bear[a]	MC-12-01	W	—	—		H	N	Fish-high density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Berdeen[a]	M-08-01	W	—	—		H	—	Fish-high density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Berdeen, Lower	M-07-01	W	0.4	X		H	N	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Berdeen, Upper	M-09-01	W	—	—		H	—	Fish-high density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Blum (Largest/Middle, No. 3)	M-11-01	W	0.3	X		H	U	Fish-high density	Fishless	Fishless	Fishless	Major (1)	Negligible	Negligible	Negligible
Blum (Lower/West, No. 4)	LS-07-01	W	0.2	X		VH	N	Fish-high density	Fish-low density	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Blum (Small/North, No. 2)	MC-01-01	W	0.3	X		N	Y	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Blum (Vista/Northwest, No. 1)	MC-02-01	W	0.3	X		N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Bouck, Lower	DD-04-01	W	—	—	X	H	—	Fish-high density	Fish-low density	Fish-low density	Fishless	Moderate	Minor	Minor	Negligible
Bouck, Upper	DD-05-01	W	0.2	X		L	Y	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Bowan	MR-12-01	E	0.4	X		L	Y	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Coon	MM-10-01	E	-0.2	X		L	Y	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Copper[b]	MC-06-01	W	-1.4	X		L	N	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Dagger	MR-04-01	E	0.5	X		H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Dee Dee, Upper	MR-15-01	E	0.2	X		H	N	Fish-high density	Fishless	Fishless	Fishless	Major (1)	Negligible	Negligible	Negligible
Dee Dee/Tamarack, Lower	MR-15-02	E	0.2	X		L	N	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Despair, Lower	M-14-01	W	—	—		N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Despair, Upper	M-13-01	W	—	—		N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Diobsud No. 1	LS-01-01	W	0.4	—	X	H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Diobsud No. 2, Lower	LS-02-01	W	0.5	X		H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Diobsud No. 3, Upper	LS-03-01	W	0.5	X		L	Y	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Doubtful	CP-01-01	E	—	—		H	N	Fish-high density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Doug's Tarn	M-21-01	W	—	—		H	N	Fish-high density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
East, Lower	MC-14-02	W	—	—		N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
East, Upper	MC-14-01	W	—	—		N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Firn	MP-02-01	W	—	—		L	—	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Green[a]	M-04-01	W	0.4	X		H	U	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Green Bench	LS-04-01	W	—	—		N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Hanging[a,c]	MC-08-01	W	NA	X		H	U	Fish-high density	Fishless	Fishless	Fishless	Major (1)	Negligible	Negligible	Negligible
Hidden[a]	SB-01-01	W	—	—		L	—	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Hidden Lake Tarn	EP-14-01	W	—	—		L	—	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Hi-Yu	M-01-01	W	0.2	X		L	Y	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible (1)	Negligible	Negligible
Hozomeen[a]	HM-02-01	W	—	—	X	VH	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Ipsoot	LS-06-01	W	0.3	X		L	U	Fish-low density	Fish-low density	Fishless	Fishless	Minor (1)	Minor (1)	Negligible	Negligible
Jeanita	DD-01-01	W	-0.5	X		L	Y	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Kettling	MR-05-01	E	0.5	X		H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Kwahnesum	MC-07-01	W	-0.9	X		L	Y	Fish-low density	Fishless	Fishless	Fishless	Minor	Minor	Negligible	Negligible
McAlester	MR-10-01	E	0.7	X		H	Y	Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Middle, Lower	MC-16-02	W	—			N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible

Lake Name	NPS Lake Code	Zone	Level of Impact		
			Alternative B	Alternative C	Alternative D
Middle, Upper	MC-16-01	W	Negligible	Negligible	Negligible
Monogram[a]	M-23-01	W	Negligible	Negligible	Negligible
Monogram Tarn	M-23-11	W	Negligible	Negligible	Negligible
Nert	M-05-01	W	Negligible	Negligible	Negligible
Noisy Creek, Upper	LS-14-01	W	Negligible	Negligible	Negligible
No Name	PM-01-01	W	Negligible	Negligible	Negligible
Panther Potholes, Lower	RD-05-02	W	Negligible	Negligible	Negligible
Panther Potholes, Upper	RD-05-01	W	Negligible	Negligible	Negligible
Pegasus	EP-10-01	W	Negligible	Negligible	Negligible
Pond SE of Kettling Lakes	MR-09-01	E	Negligible	Negligible	Negligible
Quill, Lower	M-24-02	W	Minor (1)	Negligible	Negligible
Quill, Upper	M-24-01	W	Negligible	Negligible	Negligible
Rainbow	MR-14-01	E	Negligible	Negligible	Negligible
Rainbow, Upper (North)	MR-13-01	E	Negligible	Negligible	Negligible
Rainbow, Upper (South)	MR-13-02	E	Negligible	Negligible	Negligible
Rainbow, Upper (West)	MM-11-01	E	Negligible	Negligible	Negligible
Redoubt	MC-11-01	W	Negligible	Negligible	Negligible
Reveille, Lower	MC-21-02	W	Negligible	Negligible	Negligible
Reveille, Upper	MC-21-01	W	Negligible	Negligible	Negligible
Ridley	HM-03-01	W	Minor (1)	Minor (1)	Negligible
Sky	EP-13-01	W	Negligible	Negligible	Negligible
Skymo	PM-03-01	W	Negligible	Negligible	Negligible
Sourdough	PM-12-01	W	Negligible (1)	Negligible	Negligible
Sourpuss	ML-01-01	W	Negligible	Negligible	Negligible
Stiletto	MR-01-01	E	Negligible (1)	Negligible	Negligible
Stout[a]	EP-09-02	W	Negligible	Negligible	Negligible
Stout, Lower	EP-09-01	W	Negligible	Negligible	Negligible
Sweet Pea	ML-02-01	W	Negligible	Negligible	Negligible
Talus Tarn	M-06-01	W	Negligible	Negligible	Negligible
Tapto, Lower	MC-17-03	W	Negligible	Negligible	Negligible
Tapto, Middle	MC-17-02	W	Negligible	Negligible	Negligible
Tapto, Upper	MC-17-01	W	Negligible	Negligible	Negligible
Tapto, West	MC-17-04	W	Negligible	Negligible	Negligible
Thornton, Lower	M-20-01	W	Negligible	Negligible	Negligible
Thornton, Middle	M-19-01	W	Negligible	Negligible	Negligible
Thunder	RD-02-01	W	Negligible	Negligible	Negligible
Tiny	MC-15-01	W	Negligible	Negligible	Negligible
Torment	ML-03-01	W	Negligible	Negligible	Negligible
Trapper[a]	GM-01-01	E	Negligible	Negligible	Negligible
Triplet, Lower	SM-02-01	E	Minor	Minor	Negligible
Triplet, Upper	SM-02-02	E	Negligible	Negligible	Negligible
Triumph	M-17-01	W	Minor (1)	Negligible	Negligible
Unnamed	FP-01-01	W	Negligible	Negligible	Negligible

TABLE G-4: ASSESSMENT OF IMPACTS ON AMPHIBIANS (CONTINUED)

Lake Name	NPS Lake Code	Zone	Index of Connectivity	Within Range of Distribution LTS	NWS	Fish Density	TKN ≥ 0.045 mg/L	Management Action Fish Densities				Level of Impact			
								Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Middle, Upper	MC-16-01	W	—			N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Monogram[a]	M-23-01	W	0.9	X		H	N	Fish-high density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Monogram Tarn	M-23-11	W	0.8	X		L	U	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Nert	M-05-01	W	0.2	X		L	Y	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Noisy Creek, Upper	LS-14-01	W	—		X	N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
No Name	PM-01-01	W	—			L	N	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Panther Potholes, Lower	RD-05-02	W	—		X	L	Y	Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Panther Potholes, Upper	RD-05-01	W	—		X	N	Y	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Pegasus	EP-10-01	W	—			N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Pond SE of Kettling Lakes	MR-09-01	E	0.7	X		L	N	Fish-low density	Fish-low density	Fish-low density	Fishless	Negligible	Negligible	Negligible	Negligible
Quill, Lower	M-24-02	W	0.0	X		L	U	Fish-low density	Fishless	Fishless	Fishless	Minor (1)	Minor (1)	Negligible	Negligible
Quill, Upper	M-24-01	W	0.0	X		L	U	Fish-low density	Fishless	Fishless	Fishless	Minor (1)	Negligible	Negligible	Negligible
Rainbow	MR-14-01	E	0.5	X		H	Y	Fish-high density	Fish-low density	Fish-low density	Fishless	Moderate	Negligible	Negligible	Negligible
Rainbow, Upper (North)	MR-13-01	E	0.4	X		N	Y	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Rainbow, Upper (South)	MR-13-02	E	0.4	X		L	N	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Rainbow, Upper (West)	MM-11-01	E	—			L	N	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Redoubt	MC-11-01	W	—			N	Y	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Reveille, Lower	MC-21-02	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Reveille, Upper	MC-21-01	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ridley	HM-03-01	W	—		X	L	Y	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor (1)	Minor (1)	Minor (1)	Negligible
Sky	EP-13-01	W	—			N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skymo	PM-03-01	W	0.5	X		H	N	Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Sourdough	PM-12-01	W	-0.5	X		VH	U	Fish-high density	Fishless	Fishless	Fishless	Major (1)	Negligible (1)	Negligible	Negligible
Sourpuss	ML-01-01	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stiletto	MR-01-01	E	—			L	Y	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible (1)	Negligible	Negligible
Stout[a]	EP-09-02	W	—			L	—	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stout, Lower	EP-09-01	W	—			L	N	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Sweet Pea	ML-02-01	W	—			L	N	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Talus Tarn	M-06-01	W	0.2	X		N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Lower	MC-17-03	W	—			N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Middle	MC-17-02	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, Upper	MC-17-01	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tapto, West	MC-17-04	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Thornton, Lower	M-20-01	W	-0.3	X		L	Y	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Thornton, Middle	M-19-01	W	—			L	N	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Thunder	RD-02-01	W	—		X	N	Y	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Tiny	MC-15-01	W	—			N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Torment	ML-03-01	W	—			L	N	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Trapper[a]	GM-01-01	E	—			H	N	Fish-high density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Triplet, Lower	SM-02-01	E	-0.2	X		H	Y	Fish-high density	Fish-low density	Fish-low density	Fishless	Major (1)	Minor	Minor	Negligible
Triplet, Upper	SM-02-02	E	—			H	N	Fish-high density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Triumph	M-17-01	W	0.0	X		L	U	Fish-low density	Fish-low density	Fishless	Fishless	Minor (1)	Minor (1)	Negligible	Negligible
Unnamed	FP-01-01	W	—			N	—	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible

Lake Name	NPS Lake Code	Zone	Level of Impact		
			Alternative B	Alternative C	Alternative D
Unnamed	MR-11-01	E	Negligible	Negligible	Negligible
Unnamed	MR-16-01	E	Negligible	Negligible	Negligible
Vulcan	ML-04-01	W	Negligible	Negligible	Negligible
Wilcox/Lillie, Upper	EP-06-01	W	Negligible	Negligible	Negligible
Wilcox/Sandie, Lower	EP-05-01	W	Negligible	Negligible	Negligible
Wild	MC-27-01	W	Negligible	Negligible	Negligible
Willow	HM-04-01	W	Minor (1)	Minor (1)	Negligible

Notes:

Zone: E = East side of Cascade Crest

W = West side of Cascade Crest

Index of Connectivity: An Index of Connectivity (IOC) b target lake's basin (major tributary basin). Documented salamander
breeding Lakes within 6 km (maximum colonization distan th a IOC of 0.4–0.6 have moderate connectivity, lakes with an IOC of
0–0.3 have poor connectivity, and lakes with an IOC of < (

Fish Density: H or High = > 50 trout/acre of reproducing t N or No Fish = No fish present in lake.

Within Range of Distribution: X - lake is within distributic

TKN ≥ 0.045 mg/l: (Total Kjeldahl Nitrogen) Y =Yes, TKN

Fishless: Initial management action would result in a fishl

Level of Impact: See table 31 for impact thresholds. Whe act determination, a conservative assessment was performed in view
of an absence of data for one or more factors (e.g., IOC is

a. The feasibility of complete fish removal in these lakes w

b. In August 2004, a large fish kill was observed in Copper

c. Remove all reproducing fish from Hanging Lake pending

TABLE G-4: ASSESSMENT OF IMPACTS ON AMPHIBIANS (CONTINUED)

								Management Action Fish Densities				Level of Impact			
Lake Name	NPS Lake Code	Zone	Index of Connectivity	Within Range of Distribution LTS	NWS	Fish Density	TKN ≥ 0.045 mg/L	Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Unnamed	MR-11-01	E	0.4	X		L	Y	Fish-low density	Fish-low density	Fish-low density	Fishless	Negligible	Negligible	Negligible	Negligible
Unnamed	MR-16-01	E	0.2	X		L	Y	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Negligible	Negligible	Negligible
Vulcan	ML-04-01	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Wilcox/Lillie, Upper	EP-06-01	W	—			H	N	Fish-high density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Wilcox/Sandie, Lower	EP-05-01	W	—			H	N	Fish-high density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Wild	MC-27-01	W	—			N	N	Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Willow	HM-04-01	W	—		X	L	Y	Fish-low density	Fish-low density	Fish-low density	Fishless	Minor (1)	Minor (1)	Minor (1)	Negligible

Notes:

Zone: E = East side of Cascade Crest
W = West side of Cascade Crest

Index of Connectivity: An Index of Connectivity (IOC) based on weighted calculations of potential salamander breeding lake (lakes within range of salamander distribution and having appropriate habitat) density (lakes/acre) within a target lake's basin (major tributary basin). Documented salamander breeding Lakes within 6 km (maximum colonization distance) of target lake, and number of potential salamander lakes with 0.6 km (maximum dispersal distance) of target lake. Lakes with an IOC = 0.7–0.9 have high connectivity, lakes with a IOC of 0.4–0.6 have moderate connectivity, lakes with an IOC of 0–0.3 have poor connectivity, and lakes with an IOC of < 0.0 can be considered isolated. Dash (-) indicates outside the range of long-toed salamanders (LTS) and TKN not determined.

Fish Density: H or High = > 50 trout/acre of reproducing trout or > 100 trout/acre of stocked trout; L or Low = < 50 trout/acre of reproducing trout or " 100 trout/acre of stocked trout, with a total fish density of no more than 100 trout/acre; N or No Fish = No fish present in lake.

Within Range of Distribution: X - lake is within distribution range of long-toed salamander (LTS) or Northwestern salamander (NWS) and has suitable aquatic and terrestrial habitat for all life stages.

TKN ≥ 0.045 mg/l: (Total Kjeldahl Nitrogen) Y =Yes, TKN ≥0.045 mg/L; N = No, TKN <0.045 mg/L. U = unknown concentration. Dash = outside range of salamanders.

Fishless: Initial management action would result in a fishless lake. Depending upon the results of further evaluation, the lake may be stocked with a low density of trout.

Level of Impact: See table 31 for impact thresholds. Where a (1) follows a Negligible impact determination, additional evaluation or management actions may result in a Minor impact. Where a (1) follows a Minor, Moderate, or Major impact determination, a conservative assessment was performed in view of an absence of data for one or more factors (e.g., IOC is unknown), and additional evaluation or management actions may result in a reduction of the impact by one level (e.g., reduce Major to Moderate).

a The feasibility of complete fish removal in these lakes would need to be evaluated.

b. In August 2004, a large fish kill was observed in Copper Lake, possibly due to disease. Further surveys are needed to confirm that the lake is fishless.

c Remove all reproducing fish from Hanging Lake pending agreement with British Columbia.

Drainage Basin	NPS Lake Code	Lake Name	Level of Impact			
			rnative A	Alternative B	Alternative C	Alternative D
Skagit	MP-09-01	Azure	ible	Negligible	Negligible	Negligible
Stehekin	MLY-02-01	Battalion	ate	Negligible	Negligible	Negligible
Chilliwack	MC-12-01	Bear[a]		Negligible	Negligible	Negligible
Skagit	M-08-01	Berdeen[a]		Negligible	Negligible	Negligible
Skagit	M-07-01	Berdeen, Lower		Negligible	Negligible	Negligible
Skagit	M-09-01	Berdeen, Upper		Negligible	Negligible	Negligible
Baker	M-11-01	Blum (Largest/Middle, No. 3)	ate	Negligible	Negligible	Negligible
Baker	LS-07-01	Blum (Lower/West, No. 4)	ate	Negligible	Negligible	Negligible
Baker	MC-01-01	Blum (Small/North, No. 2)	ible	Negligible	Negligible	Negligible
Baker	MC-02-01	Blum (Vista/Northwest, No. 1)	ible	Negligible	Negligible	Negligible
Skagit	DD-04-01	Bouck, Lower		Negligible	Negligible	Negligible
Skagit	DD-05-01	Bouck, Upper	ible	Negligible	Negligible	Negligible
Stehekin	MR-12-01	Bowan		Negligible	Negligible	Negligible
Stehekin	MM-10-01	Coon	ible	Negligible	Negligible	Negligible
Chilliwack	MC-06-01	Copper[b]	ible	Negligible	Negligible	Negligible
Stehekin	MR-04-01	Dagger	ible	Negligible	Negligible	Negligible
Stehekin	MR-15-01	Dee Dee, Upper	ate	Negligible	Negligible	Negligible
Stehekin	MR-15-02	Dee Dee/Tamarack, Lower		Negligible	Negligible	Negligible
Skagit	M-14-01	Despair, Lower	ible	Negligible	Negligible	Negligible
Skagit	M-13-01	Despair, Upper	ible	Negligible	Negligible	Negligible
Skagit	LS-01-01	Diobsud No. 1		Negligible	Negligible	Negligible
Skagit	LS-02-01	Diobsud No. 2, Lower		Negligible	Negligible	Negligible
Skagit	LS-03-01	Diobsud No. 3, Upper	ible	Negligible	Negligible	Negligible
Stehekin	CP-01-01	Doubtful	ate	Negligible	Negligible	Negligible
Skagit	M-21-01	Doug's Tarn		Negligible	Negligible	Negligible
Ross	MC-14-02	East, Lower	ible	Negligible	Negligible	Negligible
Ross	MC-14-01	East, Upper	ible	Negligible	Negligible	Negligible
Ross	MP-02-01	Firn		Minor	Negligible	Negligible
Skagit	M-04-01	Green[a]		Negligible	Negligible	Negligible
Skagit	LS-04-01	Green Bench	ible	Negligible	Negligible	Negligible
Chilliwack	MC-08-01	Hanging[a,c]		Negligible	Negligible	Negligible
Skagit	SB-01-01	Hidden[a]		Minor	Negligible	Negligible
Skagit	EP-14-01	Hidden Lake Tarn	ible	Negligible	Negligible	Negligible
Skagit	M-01-01	Hi-Yu	ible	Negligible	Negligible	Negligible
Ross	HM-02-01	Hozomeen[a]	ate	Negligible	Negligible	Negligible
Baker	LS-06-01	Ipsoot	ible	Negligible	Negligible	Negligible
Skagit	DD-01-01	Jeanita	ible	Negligible	Negligible	Negligible

TABLE G-5: ASSESSMENT OF IMPACTS ON NATIVE FISH

					Trout Present, Historically Present, or Scheduled for Stocking in Lake									Management Action Fish Densities				Level of Impact			
Drainage Basin	NPS Lake Code	Lake Name	Side of Cascade Crest	Surface Inlet or Outlet	Brook Trout	Westslope Cutthroat	Coastal Cutthroat	Yellowstone Cutthroat	Rainbow/ Cutthroat Hybrids	Rainbow Trout	Mt. Whitney Rainbow	Ross Lake Rainbow	Rainbow Subspecies	Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Skagit	MP-09-01	Azure	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MLY-02-01	Battalion	E	Yes						X	X			Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Chilliwack	MC-12-01	Bear[a]	W	Yes		X					*			Fish-high density	fish-low density	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	M-0B-01	Berdeen[a]	W	Yes		X					X			Fish-high density	Fish –low density	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	M-07-01	Berdeen, Lower	W	Yes		X								Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	M-09-01	Berdeen, Upper	W	Yes		X								Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Baker	M-11-01	Blum (Largest/Middle, No. 3)	W	Yes						X	*			Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Baker	LS-07-01	Blum (Lower/West, No. 4)	W	Yes	X						X			Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Baker	MC-01-01	Blum (Small/North, No. 2)	W	No										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Baker	MC-02-01	Blum (Vista/Northwest, No. 1)	W	No										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	DD-04-01	Bouck, Lower	W	Yes		X					X			Fish-high density	Fish-low density	Fish-low density	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	DD-05-01	Bouck, Upper	W	Yes									X	Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-12-01	Bowan	E	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Stehekin	MM-10-01	Coon	E	Yes		X								Fish-low density	Fish-low density	Fish-low density	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-06-01	Copper[b]	W	Yes			X				*			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-04-01	Dagger	E	Yes		X								Fish-high density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-15-01	Dee Dee, Upper	E	Yes						X	*			Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Stehekin	MR-15-02	Dee Dee/Tamarack, Lower	E	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	M-14-01	Despair, Lower	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-13-01	Despair, Upper	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	LS-01-01	Diobsud No. 1	W	Yes		X								Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	LS-02-01	Diobsud No. 2, Lower	W	Yes		X					*			Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	LS-03-01	Diobsud No. 3, Upper	W	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	CP-01-01	Doubtful	E	Yes		X			X	X				Fish-high density	Fish-low density	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Skagit	M-21-01	Doug's Tarn	W	Yes		X								Fish-high density	Fish-low density	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Ross	MC-14-02	East, Lower	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	MC-14-01	East, Upper	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	MP-02-01	Firn	W	Yes		X					*			Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Skagit	M-04-01	Green[a]	W	Yes		X			X	X	*			Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	LS-04-01	Green Bench	W	No										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-08-01	Hanging[a,c]	W	Yes						X				Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	SB-01-01	Hidden[a]	W	Yes						X	X		X	Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Skagit	EP-14-01	Hidden Lake Tarn	W	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-01-01	Hi-Yu	W	No							X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	HM-02-01	Hozomeen[a]	W	Yes	X									Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Baker	LS-06-01	Ipsoot	W	No				X						Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	DD-01-01	Jeanita	W	Yes									X	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible

Drainage Basin	NPS Lake Code	Lake Name	Level of Impact			
			native A	Alternative B	Alternative C	Alternative D
Stehekin	MR-05-01	Kettling	ate	Negligible	Negligible	Negligible
Chilliwack	MC-07-01	Kwahnesum	ble	Negligible	Negligible	Negligible
Stehekin	MR-10-01	McAlester		Negligible	Negligible	Negligible
Ross	MC-16-02	Middle, Lower	ble	Negligible	Negligible	Negligible
Ross	MC-16-01	Middle, Upper	ble	Negligible	Negligible	Negligible
Skagit	M-23-01	Monogram[a]		Negligible	Negligible	Negligible
Skagit	M-23-11	Monogram Tarn	ble	Negligible	Negligible	Negligible
Baker	M-05-01	Nert	ble	Negligible	Negligible	Negligible
Baker	LS-14-01	Noisy Creek, Upper	ble	Negligible	Negligible	Negligible
Ross	PM-01-01	No Name	ble	Negligible	Negligible	Negligible
Skagit	RD-05-02	Panther Potholes, Lower	ble	Negligible	Negligible	Negligible
Skagit	RD-05-01	Panther Potholes, Upper	ble	Negligible	Negligible	Negligible
Skagit	EP-10-01	Pegasus	ble	Negligible	Negligible	Negligible
Stehekin	MR-09-01	Pond SE of Kettling Lakes	ble	Negligible	Negligible	Negligible
Skagit	M-24-02	Quill, Lower	ble	Negligible	Negligible	Negligible
Skagit	M-24-01	Quill, Upper	ble	Negligible	Negligible	Negligible
Stehekin	MR-14-01	Rainbow	ate	Negligible	Negligible	Negligible
Stehekin	MR-13-01	Rainbow, Upper (North)	ble	Negligible	Negligible	Negligible
Stehekin	MR-13-02	Rainbow, Upper (South)		Negligible	Negligible	Negligible
Stehekin	MM-11-01	Rainbow, Upper (West)		Negligible	Negligible	Negligible
Chilliwack	MC-11-01	Redoubt	ble	Negligible	Negligible	Negligible
Chilliwack	MC-21-02	Reveille, Lower	ble	Negligible	Negligible	Negligible
Chilliwack	MC-21-01	Reveille, Upper	ble	Negligible	Negligible	Negligible
Ross	HM-03-01	Ridley	ble	Negligible	Negligible	Negligible
Skagit	EP-13-01	Sky	ble	Negligible	Negligible	Negligible
Ross	PM-03-01	Skymo		Negligible	Negligible	Negligible
Ross	PM-12-01	Sourdough	ate	Negligible	Negligible	Negligible
Ross	ML-01-01	Sourpuss	ble	Negligible	Negligible	Negligible
Stehekin	MR-01-01	Stiletto		Negligible	Negligible	Negligible
Skagit	EP-09-02	Stout[a]		Minor	Negligible	Negligible
Skagit	EP-09-01	Stout, Lower		Minor	Negligible	Negligible
Ross	ML-02-01	Sweet Pea	ble	Negligible	Negligible	Negligible
Skagit	M-06-01	Talus Tarn	ble	Negligible	Negligible	Negligible
Chilliwack	MC-17-03	Tapto, Lower	ble	Negligible	Negligible	Negligible
Chilliwack	MC-17-02	Tapto, Middle	ble	Negligible	Negligible	Negligible
Chilliwack	MC-17-01	Tapto, Upper	ble	Negligible	Negligible	Negligible
Chilliwack	MC-17-04	Tapto, West	ble	Negligible	Negligible	Negligible
Skagit	M-20-01	Thornton, Lower		Minor	Negligible	Negligible
Skagit	M-19-01	Thornton, Middle	ble	Negligible	Negligible	Negligible
Skagit	RD-02-01	Thunder	ble	Negligible	Negligible	Negligible

TABLE G-5: ASSESSMENT OF IMPACTS ON NATIVE FISH (CONTINUED)

					Trout Present, Historically Present, or Scheduled for Stocking in Lake									Management Action Fish Densities				Level of Impact			
Drainage Basin	NPS Lake Code	Lake Name	Side of Cascade Crest	Surface Inlet or Outlet	Brook Trout	Westslope Cutthroat	Coastal Cutthroat	Yellowstone Cutthroat	Rainbow/ Cutthroat Hybrids	Rainbow Trout	Mt. Whitney Rainbow	Ross Lake Rainbow	Rainbow Subspecies	Alternative A	Alternative B	Alternative C	Alternative D	Alternative A	Alternative B	Alternative C	Alternative D
Stehekin	MR-05-01	Kettling	E	Yes		X	X		X	X				Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Chilliwack	MC-07-01	Kwahnesum	W	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-10-01	McAlester	E	Yes										Fish-high density	Fishless	Fishless	Fishless	Major	Negligible	Negligible	Negligible
Ross	MC-16-02	Middle, Lower	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	MC-16-01	Middle, Upper	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-23-01	Monogram[a]	W	Yes		X					X			Fish-high density	Fish-low density	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	M-23-11	Monogram Tarn	W	No		X								Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Baker	M-05-01	Nert	W	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Baker	LS-14-01	Noisy Creek, Upper	W	No										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	PM-01-01	No Name	W	Yes							X			Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	RD-05-02	Panther Potholes, Lower	W	No			X							Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	RD-05-01	Panther Potholes, Upper	W	No										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	EP-10-01	Pegasus	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-09-01	Pond SE of Kettling Lakes	E	No							X			Fish-low density	Fish-low density	Fish-low density	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-24-02	Quill, Lower	W	No						X	X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-24-01	Quill, Upper	W	No						X	X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-14-01	Rainbow	E	Yes						X	X			Fish-high density	Fish-low density	Fish-low density	Fishless	Moderate	Negligible	Negligible	Negligible
Stehekin	MR-13-01	Rainbow, Upper (North)	E	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-13-02	Rainbow, Upper (South)	E	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Stehekin	MM-11-01	Rainbow, Upper (West)	E	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Chilliwack	MC-11-01	Redoubt	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-21-02	Reveille, Lower	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-21-01	Reveille, Upper	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	HM-03-01	Ridley	W	Yes							X	X		Fish-low density	Fish-low density	Fish-low density	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	EP-13-01	Sky	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	PM-03-01	Skymo	W	Yes		X					X			Fish-high density	Fish-low density	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Ross	PM-12-01	Sourdough	W	Yes	X						X			Fish-high density	Fishless	Fishless	Fishless	Moderate	Negligible	Negligible	Negligible
Ross	ML-01-01	Sourpuss	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-01-01	Stiletto	E	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	EP-09-02	Stout[a]	W	Yes		X	X							Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Skagit	EP-09-01	Stout, Lower	W	Yes		X								Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Ross	ML-02-01	Sweet Pea	W	Yes							X			Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-06-01	Talus Tarn	W	Yes							X			Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-17-03	Tapto, Lower	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-17-02	Tapto, Middle	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-17-01	Tapto, Upper	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Chilliwack	MC-17-04	Tapto, West	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-20-01	Thornton, Lower	W	Yes		X					X			Fish-low density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Skagit	M-19-01	Thornton, Middle	W	Yes							X		X	Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	RD-02-01	Thunder	W	No										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible

Drainage Basin	NPS Lake Code	Lake Name	Level of Impact rnative A	 Alternative B	 Alternative C	 Alternative D
Ross	MC-15-01	Tiny	ible	Negligible	Negligible	Negligible
Ross	ML-03-01	Torment	ible	Negligible	Negligible	Negligible
Stehekin	GM-01-01	Trapper[a]	ible	Negligible	Negligible	Negligible
Stehekin	SM-02-01	Triplet, Lower	ible	Negligible	Negligible	Negligible
Stehekin	SM-02-02	Triplet, Upper	ible	Negligible	Negligible	Negligible
Skagit	M-17-01	Triumph	ible	Negligible	Negligible	Negligible
Skagit	FP-01-01	Unnamed	ible	Negligible	Negligible	Negligible
Stehekin	MR-11-01	Unnamed		Negligible	Negligible	Negligible
Stehekin	MR-16-01	Unnamed		Minor	Minor	Negligible
Skagit	ML-04-01	Vulcan	ible	Negligible	Negligible	Negligible
Skagit	EP-06-01	Wilcox/Lillie, Upper		Negligible	Negligible	Negligible
Skagit	EP-05-01	Wilcox/Sandie, Lower		Minor	Negligible	Negligible
Skagit	MC-27-01	Wild	ible	Negligible	Negligible	Negligible
Ross	HM-04-01	Willow	ible	Negligible	Negligible	Negligible

Notes:

Trout Present or Scheduled for Stocking in Lake: The kes in alternatives B and C include, or may include after a period of evaluation, stocking nonreproductive trout at low densities ck of currently available hatchery trout for stocking.

Level of Impact: Refer to table 31 in the "Environmental

a. The feasibility of complete removal of fish in these lake

b. In August 2004, a large fish kill was observed in Coppe

c. Remove all reproducing fish from Hanging Lake pendin

TABLE G-5: ASSESSMENT OF IMPACTS ON NATIVE FISH (CONTINUED)

Drainage Basin	NPS Lake Code	Lake Name	Side of Cascade Crest	Surface Inlet or Outlet	Trout Present, Historically Present, or Scheduled for Stocking in Lake: Brook Trout	Westslope Cutthroat	Coastal Cutthroat	Yellowstone Cutthroat	Rainbow/ Cutthroat Hybrids	Rainbow Trout	Mt. Whitney Rainbow	Ross Lake Rainbow	Rainbow Subspecies	Management Action Fish Densities: Alternative A	Alternative B	Alternative C	Alternative D	Level of Impact: Alternative A	Alternative B	Alternative C	Alternative D
Ross	MC-15-01	Tiny	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	ML-03-01	Torment	W	Yes							X			Fish-low density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	GM-01-01	Trapper[a]	E	Yes		X					*			Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	SM-02-01	Triplet, Lower	E	Yes		X					X			Fish-high density	Fish-low density	Fish-low density	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	SM-02-02	Triplet, Upper	E	Yes		X								Fish-high density	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	M-17-01	Triumph	W	Yes							X			Fish-low density	Fish-low density	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	FP-01-01	Unnamed	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Stehekin	MR-11-01	Unnamed	E	Yes							X			Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Negligible	Negligible	Negligible
Stehekin	MR-16-01	Unnamed	E	Yes		X					*			Fish-low density	Fish-low density	Fish-low density	Fishless	Minor	Minor	Minor	Negligible
Skagit	ML-04-01	Vulcan	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Skagit	EP-06-01	Wilcox/Lillie, Upper	W	Yes		X			X	X				Fish-high density	Fishless	Fishless	Fishless	Minor	Negligible	Negligible	Negligible
Skagit	EP-05-01	Wilcox/Sandie, Lower	W	Yes		X				X	X			Fish-high density	Fish-low density	Fishless	Fishless	Minor	Minor	Negligible	Negligible
Skagit	MC-27-01	Wild	W	Yes										Fishless	Fishless	Fishless	Fishless	Negligible	Negligible	Negligible	Negligible
Ross	HM-04-01	Willow	W	Yes			X							Fish-low density	Fish-low density	Fish-low density	Fishless	Negligible	Negligible	Negligible	Negligible

Notes:

Trout Present or Scheduled for Stocking in Lake: There are 9 columns for the 9 species, subspecies, or strains of trout reproducing, stocked, or currently scheduled to be stocked in mountain lakes. Management actions for some lakes in alternatives B and C include, or may include after a period of evaluation, stocking nonreproductive trout at low densities to replace or supplement current populations of trout. These lakes are indicated with an asterisk (*) under the column for Mt. Whitney Rainbow, which would be the preferred stock of currently available hatchery trout for stocking.

Level of Impact: Refer to table 31 in the "Environmental Consequences" chapter.

a. The feasibility of complete removal of fish in these lakes would need to be evaluated.

b. In August 2004, a large fish kill was observed in Copper Lake, possibly due to disease. Further surveys are needed to confirm that the lake is fishless.

c. Remove all reproducing fish from Hanging Lake pending agreement with British Columbia.

REFERENCES CITED IN APPENDIX G

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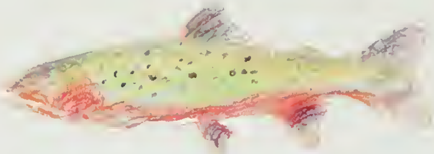
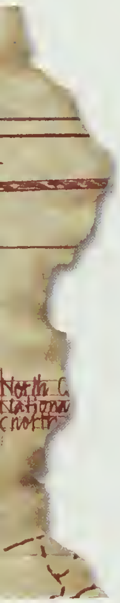


Appendix H

Estimating Fish Densities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APPENDIX H: ESTIMATING FISH DENSITIES

ESTIMATING REPRODUCING DENSITIES OF FISH

Fish density was determined by using available data from existing reports and research that was conducted to measure fish densities in lakes. The Liss et al. 1999 Phase II report contains a table (table 4.3) of mark-and-recapture densities for 10 lakes with reproducing (self-sustaining) fish populations. In that table, the average reported density for each of the 10 lakes was applied to each year between 1989 and 2003. For these 10 lakes, the data collected by Oregon State University and the U.S. Geological Survey are listed in table H-1.

For some of the lakes, fish densities were estimated from mark-and-recapture data for sampled reproducing populations (Liss et al. 1998), stocking records, and calculated annual mortality rates of stocked fish. Others were estimated from a variety of other information reported in Liss et al. 1998, including apparent impacts to long-toed salamanders and the condition of fish in a particular lake. A density of 222 fish/acre was considered to be the average density for reproducing fish populations in lakes with high densities of fish. Unless a lake was reported to have a lower density of reproducing fish or a population of brook trout, a density of 222 fish/acre was used for each year for lakes with reproducing fish.

Reproducing brook trout populations are seldom maintained at low densities and have been reported to reach densities as high as 700 fish/acre. For lakes in the North Cascades Complex with reproducing brook trout populations, the following numbers were used: an average of 222 fish/acre for lakes with high densities and a maximum of 700 fish/acre (average of 461 fish/acre).

There were few lakes with low densities of reproducing fish; the densities in these lakes ranged from 11 to 53 fish/acre, for an average of 33 fish/acre. Other lakes contained low densities of reproducing fish, where reproduction was inadequate to sustain fish populations. If these low-density reproducing populations are not supplemented with hatchery fish, they would likely be eliminated over a period of a few decades due to variations in reproductive success. The average value of 33 fish/acre was applied to these lakes for each year between 1989 to 2003.

ESTIMATING DENSITIES FOR LAKES WITH NONREPRODUCING FISH AND MIXED-MANAGEMENT LAKES

Maximum literature values for yearly survival rates of fish stocked in mountain lakes (including both natural and angling mortalities) are about 90% survival for the first two years (before fish are large enough to be caught by anglers) and 60% each year after they enter the sport fishery. For the first two years after stocking, the stocking density was multiplied by a 90% survival rate. After the first two years, a 60% survival rate was used. Year-by-year after stocking, fish numbers for a stocked year class generally declined in an exponential fashion until about the 10th year after stocking, when approximately 1 fish/acre would be left.

Some lakes have a combination of nonreproducing and reproducing fish. In these mixed-management lakes, both approaches were used for estimating density. For each lake, the total density per year was calculated. This number represents the total number of stocked fish from each stocked year class and fish from natural reproduction that were present in a lake for each calendar year. The total yearly densities for each year from 1989 to 2003 are presented in table H-1 for each of the 91 lakes in the North Cascades Complex that has a history of fish stocking.

Using this information, table 6 in the "Alternatives" chapter was generated to show the average density for each lake.

TABLE H-1: FISH SURVIVAL CALCULATIONS

Lake Name	NPS Lake Code	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Azure	MP-09-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Battalion	MLY-02-01	237	289	280	272	252	237	230	267	261	256	242	232	227	225	223
Bear	MC-12-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Berdeen	M-08-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Berdeen, Lower	M-07-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Berdeen, Upper	M-09-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Blum (Largest / Middle No. 3)	M-11-01	222	222	222	222	382	420	400	344	287	255	238	230	226	224	223
Blum (Lower / West, No. 4)	LS-07-01	461	461	461	461	461	461	461	461	461	461	461	461	461	461	461
Blum (Small / North, No. 2)	MC-01-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Blum (Vista / Northwest, No. 1)	MC-02-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bouck, Lower	DD-04-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Bouck, Upper	DD-05-01	27	69	56	48	28	14	62	53	46	28	69	56	48	28	14
Bowan	MR-12-01	77	65	57	34	17	8	111	98	88	53	26	13	7	111	99
Coon	MM-10-01	159	213	154	210	152	111	64	32	16	8	4	104	93	83	50
Copper	MC-06-01	105	90	78	47	77	60	50	29	15	76	66	58	34	17	9
Dagger	MR-04-01	259	259	259	259	259	259	259	259	259	259	259	259	259	259	259
Dee Dee, Upper	MR-15-01	53	52	52	51	51	51	51	51	51	51	92	88	84	71	61
Dee Dee (Tamarack, Lower)	MR-15-02	43	43	43	43	43	43	43	43	43	43	43	43	43	43	43
Despair, Lower	M-14-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Despair, Upper	M-13-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Diobsud No. 1	LS-01-01	11	61	56	52	35	23	17	14	13	12	11	0	0	0	11
Diobsud No. 2, Lower	LS-02-01	74	274	254	236	171	123	98	86	80	77	76	75	74	74	74
Diobsud No. 3, Upper	LS-03-01	35	30	27	16	98	85	75	45	99	80	68	40	20	10	5

TABLE H-1: FISH SURVIVAL CALCULATIONS (CONTINUED)

Lake Name	NPS Lake Code	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Doubtful	CP-01-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Doug's Tarn	M-21-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
East, Lower	MC-14-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
East, Upper	MC-14-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Firn	MP-02-01	82	73	44	22	11	5	3	1	1	0	0	26	23	21	13
Green	M-04-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Green Bench	LS-04-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hanging	MC-08-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Hidden	SB-01-01	127	115	82	58	93	82	75	58	93	82	75	58	94	83	76
Hidden Lake Tarn	EP-14-01	10	5	53	47	42	25	13	6	54	47	42	25	13	62	54
Hi-Yu	M-01-01	20	10	5	3	1	112	100	90	138	103	82	48	108	87	74
Hozomeen	HM-02-01	461	461	461	461	461	461	461	461	461	461	461	461	461	461	461
Ipsoot	LS-06-01	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Jeanita	DD-01-01	78	56	44	39	36	34	34	33	33	33	33	33	33	33	33
Kettling	MR-05-01	103	103	103	103	103	103	103	103	103	103	103	103	103	103	103
Kwahnesum	MC-07-01	199	173	128	72	188	155	132	78	39	182	156	136	81	41	20
McAlester	MR-10-01	204	204	204	204	204	204	204	204	204	204	204	204	204	204	204
Middle, Lower	MC-16-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Middle, Upper	MC-16-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monogram	M-23-01	264	243	232	227	225	223	275	269	264	247	235	228	225	224	223
Monogram Tarn	M-23-11	50	50	50	50	50	50	50	50	50	50	50	50	50	50	50
Nert	M-05-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Noisy Creek, Upper	LS-14-01	0	0	0	0	0	0	0	0	0	0	0				0
No Name	PM-01-01	83	69	58	35	84	69	59	35	17	9	4	2	1	1	0
Panther Potholes, Lower	RD-05-02	77	141	106	80	46	98	79	67	39	20	10	5	2	1	1
Panther Potholes, Upper	RD-05-01	288	234	137	69	34	17	9	4	2	1	0	0	0	0	0
Pegasus	EP-10-01	0	0	0	0	0	0	0	0	0	0	0				0

TABLE H-1: FISH SURVIVAL CALCULATIONS (CONTINUED)

Lake Name	NPS Lake Code	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Pond SE of Kettling Lakes	MR-09-01	29	26	16	8	44	38	33	20	10	45	38	34	20	10	5
Quill, Lower	M-24-02	58	56	53	45	39	36	35	34	33	33	33	33	33	68	65
Quill, Upper	M-24-01	54	52	50	43	38	36	34	34	33	33	33	33	33	62	59
Rainbow	MR-14-01	233	233	233	233	233	233	233	233	233	233	233	233	233	233	233
Rainbow, Upper (North)	MR-13-01	646	578	346	173	87	43	22	11	5	3	1	1	0	0	0
Rainbow, Upper (South)	MR-13-02	114	150	105	71	39	20	10	34	29	25	15	7	4	2	1
Rainbow, Upper (West)	MM-11-01	112	100	60	30	15	8	4	2	1	40	36	33	19	10	5
Redoubt	MC-11-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reveille, Lower	MC-21-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reveille, Upper	MC-21-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ridley	HM-03-01	108	87	51	57	42	32	65	51	42	71	54	89	67	50	29
Sky	EP-13-01	0	0	0	0	0	0	0	0	0	0	0				0
Skymo	PM-03-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Sourdough	PM-12-01	461	461	461	461	612	748	719	657	571	652	611	585	534	497	479
Sourpuss	ML-01-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Stiletto	MR-01-01	47	40	36	21	11	5	41	36	31	19	9	5	2	1	1
Stout	EP-09-02	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Stout, Lower	EP-09-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Sweet Pea	ML-02-01	36	30	25	15	36	30	25	15	8	4	41	36	32	19	10
Talus Tarn	M-06-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tapto, Lower	MC-17-03	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tapto, Middle	MC-17-02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tapto, Upper	MC-17-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tapto, West	MC-17-04	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thornton, Lower	M-20-01	95	85	51	26	13	6	3	2	1	112	101	91	54	27	14
Thornton, Middle	M-19-01	98	72	57	33	162	139	122	73	165	134	114	67	34	51	39
Thunder	RD-02-01	628	413	269	190	124	90	64	48	40	37	35	34	33	33	33

TABLE H-1: FISH SURVIVAL CALCULATIONS (CONTINUED)

Lake Name	NPS Lake Code	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Tiny	MC-15-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Torment	ML-03-01	7	40	35	31	18	9	47	40	35	21	10	5	3	1	1
Trapper	GM-01-01	222	222	222	222	222	222	222	222	222	222	222	222	222	222	222
Triplet, Lower	SM-02-01	193	193	193	193	193	193	193	193	193	193	193	193	193	193	193
Triplet, Upper	SM-02-02	186	186	186	186	186	186	186	186	186	186	186	186	186	186	186
Triumph	M-17-01	75	61	51	30	108	91	79	47	94	75	63	37	18	43	35
Unnamed	FP-01-01	0	0	0	0	0	0	0	0	0	0	0				0
Unnamed	MR-11-01	29	81	65	52	71	51	92	70	54	71	52	40	23	66	54
Unnamed	MR-16-01	37	37	37	37	37	37	37	37	37	37	37	37	37	37	37
Vulcan	ML-04-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wilcox/Lillie, Upper	EP-06-01	257	240	301	289	281	257	240	231	226	224	223	223	222	222	222
Wilcox/Sandie, Lower	EP-05-01	256	239	230	226	298	290	282	258	240	231	227	224	223	223	222
Wild	MC-27-01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Willow	HM-04-01	210	166	97	80	80	74	106	86	71	96	90	129	98	90	57

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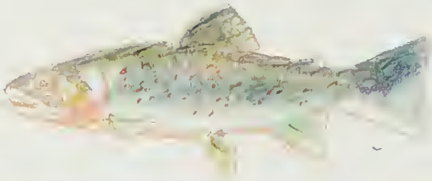
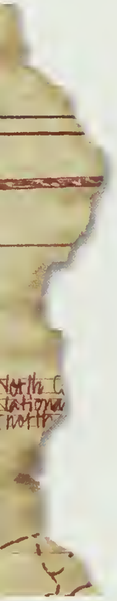


Appendix I

MOUNTAIN LAKES FISHERY CURRENT AND PROPOSED MITIGATION PRACTICES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APPENDIX I: MOUNTAIN LAKES FISHERY
CURRENT AND PROPOSED MITIGATION PRACTICES

Alternative A: No Action—Existing Management Framework of 91 Lakes (62 Lakes Have Fish)

Alternative B: Proposed Adaptive Management of 91 Lakes under a New Framework (42 Lakes May Have Fish) (Preferred Alternative)
Alternative C: Proposed Adaptive Management of 91 Lakes under a New Framework (11 National Recreation Area Lakes May Have Fish)

Alternative D: 91 Lakes Would Be Fishless (Environmentally Preferred Alternative)

Action	Alternative A	Alternative B	Alternative C	Alternative D	Responsible Agency
Lake Stocking	To make sure stocked fish do not reproduce and affect downstream fish, sterile fish are stocked in many lakes. For lakes where monitoring shows that fish densities in a lake are having adverse effects on fish health, the density and cycle of fish stocking are adjusted to allow periods of low density. The Park Headquarters and Offices department would continue to issue brochures about park areas, in general, and about minimum impact practices. Information about fishing refers to the Washington State fishing regulations. Literature about the stocking program is available from the Washington Department of Fish and Wildlife. The National Park Service maintains the North Cascades Complex website that provides an abundance of information on the national park and national recreational areas: http://www.nps.gov/NOCA/. Informational signs about fish stocking are posted in the park.	Same as under alternative A with the following additions: For lakes where removal of reproducing fish may not be feasible because of the complexity of the associated stream where reproduction occurs, it may be possible to reduce the access to the area in order to minimize impacts to vegetation. Additional signs could be posted in the riparian areas that are most heavily used to allow for recovery of vegetation. For lakes where monitoring shows that fish densities are having more adverse effects on other biota than would be acceptable, the density of stocked fish would be reduced, or the stocking of the lake could become cyclical to allow periods of very low density or no fish, which would allow populations of other affected organisms to rebound. If monitoring indicates that unacceptable adverse effects continue despite reduced densities, stocking would be discontinued to allow for a fishless condition in the lake. For more information about monitoring and adaptive management, see appendix F and, also, the "Adaptive Management" section in the "Alternatives" chapter of this document. • If possible, camp at least 200 feet from the nearest lake or stream. • Use camp stoves instead of building a fire. Where campfires are legal and safe, use an established fire ring and only small pieces of dead and downed wood.	Same as alternative B.	N/A	

Action	Alternative A	Alternative B	Alternative C	Alternative D	Responsible Agency
Lake Stocking (continued)		• Pack out the offal (carcass) from any fish kept, or dispose of it in a manner that will not attract wildlife or harm the aesthetics of the area. • Be mindful of damaging fragile vegetation, both along the shoreline and in campsites. Always camp in established campsites and walk on established trails to avoid trampling fragile vegetation and compacting soil. • Do not alter campsites or build structures such as tables or lean-tos. Stocking would have to occur after lakes thaw (which varies according to elevation and aspect) and before fall in order for fry to acclimatize to the lakes. Visitors would be informed of airplane stocking schedules. Rangers issuing backcountry permits would advise visitors of any impending aircraft stocking and suggest alternate destinations. Aircraft stocking would only be used if it were determined that fish would not survive a long-distance backpack trip. As part of a monitoring component of this plan, the park would gather more data about the effects of shoreline trampling and would establish a threshold and actions to implement, such as restoring soils.			
Mechanical Fish Removal	N/A	**For gillnets:** Where needed to reduce or avoid certain impacts, timing of the activity would be controlled to avoid conflicts with other specific species' activities or important use periods. No gillnets would be left unsupervised. Crews would free any wildlife observed in the nets. If necessary, nets would be cut to free an animal. If wildlife were injured during entrapment, they would be taken to an approved wildlife rehabilitation center for treatment. In order to mitigate trampling of shoreline vegetation, crews would be kept small and would walk in the lake, rather than along the shoreline when setting nets. In addition, crews would camp far enough from the lake to minimize impacts to the shoreline.	Same as alternative B.	Same as alternative B.	

Action	Alternative A	Alternative B	Alternative C	Alternative D	Responsible Agency
Mechanical Fish Removal (continued)		The park would post information about gillnetting schedules and locations on bulletin boards, the website for the North Cascades Complex, and visitor centers. Because most of the lakes in the study area cannot be reached and fished in one day, rangers who issue backcountry permits (which are required for overnight camping) would inform hikers and anglers of any gillnetting activity scheduled at their destination, and could recommend alternative lakes to visit. In addition, the park could take a less intensive, more long-term approach to netting in high-use areas in order to help ensure a positive visitor experience for anglers. To reduce impacts on vegetation, rafts or float tubes would be preferred over boats for setting and checking nets. In addition, crews would camp far enough from the lake to minimize impacts to the shoreline. **For electrofishing:** Where needed to reduce or avoid certain impacts, timing of the activity would be controlled to avoid conflicts with other specific species' activities or important use periods.	Same as alternative B	Same as alternative B	
		Crews would wear neoprene waders and would walk in the water rather than along the shoreline to reduce shoreline trampling. This method would require a one-time application; repeat visits would not be necessary, which would minimize the amount of trampling. In addition to fish, any other organism in the water where the current is applied would be shocked or possibly killed. However, the larger the organism, the greater the shock, making fish the most susceptible. Because the waters in the North Cascades Complex have a low ionic content, they do not carry a charge very well, reducing potential effects to nonfish wildlife. Visitors receiving backcountry permits for overnight camping would also be informed of any treatment scheduled at their destination. To reduce impacts on vegetation, rafts or float tubes would be preferred over boats for setting and checking nets. In addition, crews would camp far enough from the lake to minimize impacts to the shoreline.			

Action	Alternative A	Alternative B	Alternative C	Alternative D	Responsible Agency
Mechanical Fish Removal (continued)		If used, generators would produce a small amount of noise (roughly equivalent to a loud conversation between two people), which would affect solitude and visitor experience. Visitors would be advised of dates and locations where electrofishing would occur. Where needed to reduce or avoid certain impacts, timing of the activity would be controlled to avoid conflicts with other specific species' activities or important use periods.			
	N/A	**For trapping**: Amphibian adults, which may not survive prolonged submersion, can be captured in minnow traps or entangled in the mesh of fyke nets. Minnow traps and the mesh of fyke nets should be inspected daily to reduce or eliminate amphibian mortalities. Because aquatic mammals and birds may be captured in fyke nets long enough to die from prolonged submersion, it is recommended that the upper portion of the net be above water to avoid mortalities.	Same as alternative B.	Same as alternative B.	
	N/A	**For spawning habitat removal:** In order to mitigate trampling shoreline vegetation and dispersing rocks, crews would walk in the water as much as possible, rather than along the shoreline. As described under gillnetting, any camping would occur far from the lake in order to reduce impacts to shoreline vegetation. Visitors would be advised of dates and locations where spawning habitat removal would occur. Rangers issuing backcountry permits to overnight campers would also inform those visitors of any treatment scheduled at their destination.	Same as alternative B.	Same as alternative B.	
Chemical Fish Removal		Where needed to reduce or avoid certain impacts, timing of the activity would be controlled to avoid conflicts with other specific species' activities or important use periods.			

Action	Alternative A	Alternative B	Alternative C	Alternative D	Responsible Agency
Chemical Fish Removal (continued)	N/A	Piscicides being dripped into streams flowing out of a lake could carry that toxicant to downstream waters. Because antimycin is very sensitive to oxidation, exposing it to oxygen rapidly breaks it down (Rosenlund 1992). Potassium permanganate, an oxidizer, would be placed at outlet streams to remove residual antimycin and prevent it from traveling downstream. In addition, agitation and loss of elevation would result in loss of toxicity due to oxidation (Rosenlund 1992). Many streams leaving high mountain lakes in the study area quickly become waterfalls, and the oxidation that occurs as the water drops and becomes agitated also helps to further break down the chemical (NPS, R. Zipp, pers. comm. with P. Steinholtz, 2003). Antimycin dose rates would be double verified and monitored to prevent inadvertent overdoses, and neutralization (potassium permanganate) would be on hand as a contingency measure. Antimycin can affect other aquatic organisms besides fish. However, as mentioned above, the concentration of antimycin necessary to remove fish has little or no effect on other aquatic animals. Some mortality to other species may occur, but numbers are likely to be minimal (NPS, R. Zipp, pers. comm. with P. Steinholtz, 2003). Crews treating lakes with antimycin would be required to wear eye protection and gloves. No one wearing contact lenses would be allowed to participate in antimycin treatment because fumes can penetrate soft contact lenses. A safety and organizational briefing would be conducted for personnel involved in the project, which would include the goal of the project, safety, operation of treatment equipment, and delegation of duties. Everyone working with antimycin would be given a copy of the product label. As described under the mechanical methods, crews delivering treatment from the shoreline could trample vegetation (chemical treatment would require shoreline applications) (Rosenlund 1992). All of the mitigation methods described under gillnetting would also be adhered to (for example, crews would walk in the lake water rather than along the shoreline and camp away from the lake).	Same as alternative B.	Same as alternative B.	

Action	Alternative A	Alternative B	Alternative C	Alternative D	Responsible Agency
Chemical Fish Removal (continued)		Also, as described under gillnetting, anglers would experience diminished visitor experience during chemical application. Educational materials about treatment dates and locations would be posted at bulletin boards, on the website for the North Cascades Complex, and at visitor centers. Park rangers would alert visitors to such activities when backcountry permits are issued. If necessary, lakes would be closed to fishing immediately after treatment until it is determined that the chemical has dissipated to ensure treated fish are not caught and consumed. Visitors would be given educational materials explaining the closures and describing how to recognize fish treated with antimycin (the fish become discolored and lethargic). In addition, antimycin breaks down very quickly in a fish's body, reducing the likelihood of contamination if fish are caught and consumed (NPS, R. Zipp, pers. comm. with P. Steinholtz, 2003; Rosenlund 1992). NPS staff would use boats to release chemical piscicides (to the extent they are able to avoid trampling vegetation) and for logistical reasons. Staff would avoid walking on vegetation around the lake, and in particular, on meadow or riparian vegetation where state listed plant species are more likely to occur.			
Natural Fish Removal	N/A	Increased trampling of shoreline vegetation could occur as a result of incentives that encourage anglers to increase the amount of fishing to help reduce fish populations. The NPS would provide additional educational information about shoreline sensitivity by posting information on bulletin boards, the website for the North Cascades Complex, and at visitor centers. Rangers who issue backcountry permits would also provide such educational material to anglers who are camping.	Same as alternative B.	Same as alternative B.	

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Appendix J

Documents and Plans Related to Cultural Resources

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APPENDIX J: DOCUMENTS AND PLANS RELATED TO CULTURAL RESOURCES

This appendix lists documents and plans related to cultural resources within North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area. In addition to these planning documents, there are a variety of technical project reports authored by archeological staff at the North Cascades Complex and outside contractors that document specific archeological studies conducted within North Cascades Complex boundaries. A comprehensive list of all such documents has been prepared in the North Cascades National Park Service Complex Archeological Resources Bibliography.

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- *Buckner Homestead Historic District Final Management Plan*, 1998
- Contested Terrain: North Cascades National Park Service Complex. An Administrative History, 1998

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An Ethnographic Overview and Assessment of North Cascades National Park Service Complex. National Park Service, Cultural Resources, Seattle, WA.

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1988 Ethnography of the North Cascades. Center for Northwest Anthropology, Washington State University: Project Report Number 7. U.S. Department of the Interior: National Park Service.

MUSEUM OBJECTS

- *Resource Management Plan* (1994)
- *Collection Management Plan* (1994)
- *Buckner Homestead Historic District Final Management Plan* (1998)
- North Cascades National Park Service Complex Collection Condition and Preservation Assessment (1998)
- *Cultural Resource Housekeeping Plan* (unpublished draft)

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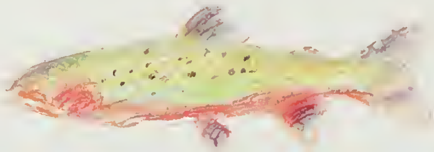
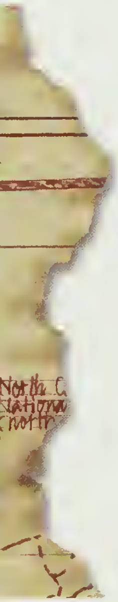


Appendix K

Minimum Requirements Decision Guide
Overview, Instructions, and Worksheets

Washington Department of Fish and Wildlife Comments on the Minimum Requirements Analysis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APPENDIX K:

MINIMUM REQUIREMENTS DECISION GUIDE OVERVIEW, INSTRUCTIONS, AND WORKSHEETS

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE COMMENTS ON THE MINIMUM REQUIREMENTS ANALYSIS

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE

OVERVIEW

... except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

– The Wilderness Act, 1964

Introduction

The Minimum Requirement Decision Guide (MRDG) is designed to assist wilderness managers in making appropriate decisions in wilderness. Use of the MRDG requires familiarity with the difference between wilderness and other public lands as defined by the Wilderness Act

This Overview document provides general information about the MRDG process, its origination, and how it relates to other processes such as NEPA. Please refer to the accompanying *MRDG Instructions* and *MRDG Worksheets* for specific information about completing the MRDG.

Wilderness Act Guidance

The concept of Minimum Requirement comes from Section 4(c) of the Wilderness Act of 1964

> "Except as specifically provided for in this Act, and subject to existing private rights, there shall be no commercial enterprise and no permanent road within any wilderness area designated by this Act and except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act (including measures required in emergencies involving the health and safety of persons within the area), there shall be no temporary road, no use of motor vehicles, motorized equipment or motorboats, no landing of aircraft, no other form of mechanical transport, and no structure or installation within any such area." (emphasis added)

Applicable actions include, but are not limited to, scientific monitoring, research, recreational developments (trails, bridges, signs, etc.), and activities related to special provisions mandated by the Wilderness Act or subsequent legislation (such as grazing, exercising mineral rights, access to inholdings, maintenance of water developments, and commercial services).

The following three boxes contain excerpts from the Wilderness Act of 1964 that may be useful reminders of key provisions of the law applicable to the use of this Minimum Requirements Decision Guide.

What is the purpose of wilderness?

"In order to assure that an increasing population, accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States ..., leaving no lands designated for preservation and protection in their natural condition, it is hereby declared to be the policy of Congress to secure for the American people of present and future generations the benefits of an enduring resource of wilderness." Section 2(a)

What is wilderness?

"... lands designated for preservation and protection in their natural condition..." Section 2(a)

"... an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habitation..." Section 2(c)

"... generally appears to have been affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable..." Section 2(c)

"... has outstanding opportunities for solitude or a primitive and unconfined type of recreation... and may also contain ecological, geological, or other features of scientific, educational, scenic, or historical value." Section 2(c)

How is wilderness administered?

"... shall be administered for the use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness, and so as to provide for the protection of these areas, the preservation of their wilderness character, and for the gathering and dissemination of information regarding their use and enjoyment as wilderness..." Section 2(a)

"A wilderness, in contrast with those areas where man and his works dominate the landscape, is hereby recognized as an area where the earth and its community of life are untrammeled by man, where man is a visitor who does not remain." Section 2(c)

"An area of wilderness is... protected and managed so as to preserve its natural conditions and... its preservation and use in an unimpaired condition..." Section 2(c)

"... each agency administering wilderness... shall be responsible for preserving the wilderness character of the area..." Section 4(b)

"... wilderness areas shall be devoted to the public purposes of recreational, scenic, scientific, educational, conservation, and historical use." Section 4(b)

In addition to the Wilderness Act, subsequent legislation and agency policy may influence determination of the minimum required for action. In some instances, Agencies have included more guidance and definitions in their respective policies. Please See *Agency Guidelines* for more specific information.

Use of this Guide

The MRDG is a process to identify, analyze, and select management actions that are the minimum necessary for wilderness administration. It applies this direction from the Act and incorporates a two-step process. Step 1 determines whether it is ***necessary*** to take action. If action is found to be necessary, then Step 2 provides guidance for determining the ***minimum*** action.

The MRDG can be used as:
- a process for evaluation and documentation;
- a guide to help discuss proposals with interested parties; or
- a review of on-going management practices to determine if they are necessary or if a less intrusive practice can be implemented

The level of detail and effort necessary to utilize the MRDG process depends on the scope and complexity of the issue or problem being considered. One person might adequately analyze simple actions, complex actions may require the coordination of several specialists. The MRDG Worksheets provide a series of questions about the necessity of taking any action to resolve a situation and the most appropriate methods or tools to use. The decision to approve an action is a critical aspect of wilderness management. At times, the decision is not straightforward and requires a delicate balancing act.

Emergencies

Do not use the MRDG for emergency situations; follow procedures already outlined in approved emergency plans. The minimum requirements concept should be incorporated into such plans when they are being prepared, so that minimum necessary methods and tools are being utilized to meet the needs of the emergency.

Safety

The safety of wilderness visitors, employees, volunteers, and contractors is a priority in all decisions and actions. Complying with Section 4(c) of The Wilderness Act and conducting a minimum requirements analysis using the MRDG does not alter or diminish this need

The MRDG is intended to help identify, analyze and select management actions that are the minimum necessary for wilderness without compromising safety. A fair and honest evaluation of all available options, within agency safety requirements. is needed to make an appropriate decision for wilderness. Wilderness managers are encouraged to learn, cultivate, and share traditional and primitive skills and develop alternative minimum impact methods and tools that allow activities to be accomplished safely with a minimal amount of degradation to the wilderness character.

The Minimum Requirements Analysis and NEPA Analysis

The Minimum Requirements Decision Guide is designed to flow into a NEPA format, if needed. Portions of the MRDG may be transferable to a subsequent NEPA analysis.

Agency NEPA guidelines do not necessarily require a process to determine if administrative action in wilderness is necessary or to select the tool and method that causes the least adverse effect to wilderness character. The minimum requirements analysis provides a method to determine the necessity of an action and how to minimize impacts; NEPA analysis compares and discloses the environmental effects of alternatives, documents a decision, and requires public involvement.

Process Comparison

Minimum Requirements Analysis	NEPA Analysis
STEP 1: Determine if Action is necessary.	
Description	Purpose and need for action Existing environment or condition
Valid existing rights, special provisions, other legislation, or other guidance from policy or plans (Step 1 A-C)	Management direction
Wilderness character (Step 1 E) Public purposes of wilderness (Step 1 F)	Issues
STEP 2: Determine the minimum tool.	
Alternative descriptions	Proposed Action and Alternatives
Alternative comparison criteria	Alternative comparison by issues
Effects to wilderness character	Environmental consequences
Selected alternative	Decision
Rationale	Reasons for the decision
Monitoring/reporting requirements	Decision conditions

The Minimum Requirements Analysis and the Planning Process

The degree to which a Minimum Requirements analysis can be useful in the planning process will vary depending on the scope of the process and the objectives for the plan. Listed below are the three typical planning levels in use by the agencies and a suggested use of the Minimum Requirements Analysis.

Planning Level	Use of Minimum Requirements Analysis
Comprehensive Land Use Planning (i.e. forest plans, park plans, refuge plans, resource management plans, and wilderness management plans) – Establish or modify general unit standards and guidelines and/or make land use allocations	Use the minimum requirements to help screen alternatives in anticipation authorizing needed actions in the future while insuring the preservation of wilderness character
Programmatic Planning (i.e. Trail Plans, Weeds Treatment Plans, Monitoring Plans, Restoration Plans, Step Down Plans, etc.) - Analysis of multiple, similar, or routine project proposals or activities (trail maintenance, monitoring, dam maintenance, etc.) in one assessment	Use the Minimum Requirements Decision Guide to prepare a single analysis for similar, current, and potential actions. Create a 'decision tree' or 'GO/NO GO checklist' to be able to assess the necessity for action involving the Section 4(c) uses as similar needs come along in the future.
Project or Site Specific Planning (i.e. wildlife survey, stream crossing, trail repair, weed treatment, etc.) - Analysis of site-specific or non-recurring actions	Use the Minimum Requirements Decision Guide to determine if action is necessary and, if so, determine the minimum tool.

ARTHUR CARHART NATIONAL WILDERNESS TRAINING CENTER

MINIMUM REQUIREMENTS DECISION GUIDE

INSTRUCTIONS

"... except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

– The Wilderness Act, 1964

Introduction

The Minimum Requirements Decision Guide (MRDG) is designed to assist wilderness managers in making appropriate decisions for wilderness. These instructions refer to completing the MRDG *Worksheets*. More information about the background of the MRDG, and its appropriate uses can be found in the *Overview*. Please also refer to your agency policies and other guidance in *Agency Guidelines* for more direction on how and when to use the MRDG.

Use of this document assumes familiarity with the Wilderness Act, other relevant legislation, and agency policy.

The MRDG is derived from Section 4(c) of the Wilderness Act and involves two steps. Step 1 determines whether action is ***necessary*** If action is necessary, then Step 2 provides guidance for determining the ***minimum*** necessary action.

Worksheet Instructions

Step 1: Determine if it is necessary to take action.

Description: Briefly describe the situation that may prompt action. This is not a description of a possible method or tool, but rather the situation that prompts the possible need for action. This step should **not** be used to justify use of motorized equipment or mechanical transport, or to approve placement of a structure, facility, or temporary road.

Correct Examples of description	Incorrect examples of description
An administrative cabin is deteriorating	Need to restore the administrative cabin
A request is received for access into a valid, existing mining claim	Need to build a temporary road for mining claim access.
Blown down trees are blocking trails	Need to use chainsaws to clear the blown down trees
Lack of information on a wildlife species	Need to land a helicopter to survey population
Fire alters wildlife habitat	Need to re-seed area to maintain wildlife habitat
User conflict complaints between stock users and hikers	Need to survey visitors about user conflicts or close trail to one type of use
A trail bridge has washed out	Need to replace the washed out bridge, using mules for supplies
Riverbank erosion is destabilizing a pioneer cabin listed on the National Historic Register	Need to sling-load rock gabions to stop erosion
Lack of information on air quality in Class I wilderness airshed	Need to set up air quality monitoring station in wilderness
Invasive species present	Need to use motorized sprayer to treat invasives

A. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Are there valid existing rights or is there a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of action involving Section 4(c) uses? Cite law and section.

If there is special provision language (e.g.. maintenance of dams and water storage facilities with motorized equipment and mechanical transport, control of fire, insects and disease, access to private lands, etc), whether in the Wilderness Act of 1964 or subsequent designation legislation, some actions may be required that would otherwise be prohibited. The exact reference to the legislation is needed in this box. Examples include:

Existence of public use cabins and subsistence use and access in Wilderness (Alaska National Interest Lands Conservation Act of 1980, P.L. 96-487, Sec. 1315(c)).

Use of motorboats of ten horsepower or less in the Okefenokee Wilderness (Wilderness Act of 1964, P.L. 88-577, Sec. 4(d)(1); Okefenokee Wilderness Act of 1974, P.L. 93-430, Sec.2).

Some Valid Existing Rights or the provisions of special legislation may be satisfied by an option outside wilderness. Such possibilities should be explored.

B. Describe Requirements of Other Legislation

Do other laws require action?

Laws not directly concerned with wilderness (such as the Endangered Species Act or National Historic Preservation Act) may influence the need for actions in Wilderness. In some instances, the administrator is asked to satisfy the requirements of at least two laws. For example:

Recovery of an endangered species dependent on wilderness ecosystems (Endangered Species Act).
Treatment of site listed on the National Register of Historic Places (National Historic Preservation Act).

Apparent conflicts between the Wilderness Act and other legislation may require innovative approaches. Not all apparent conflicts are genuine.

C. Describe Other Guidance

Does taking action conform to and implement relevant standards and guidelines and direction contained in agency policy, unit and wilderness management plans, species recovery plans, tribal government agreements, or state, local government, or interagency agreements?

Review guidance for conformance and carefully consider the context of the guidance, plan or agreement. Plans developed using a NEPA analysis are decisions that provide stronger guidance than plans developed with less public or interdisciplinary involvement. Examples include:

A programmatic decision to treat invasive weeds has already been addressed in a unit level plan that included wilderness. No decision was made regarding the method of treatment.
The need for bridges, fords, or in-stream structures has been addressed in a fish species recovery plan. The plan does not dictate the type of structure, method of construction, or tools required.

Even if relevant programmatic decisions have already been made that satisfy Step 1 of a Minimum Requirements analysis, both Step 1 and Step 2 should be completed to determine the minimum tool or method.

D. Describe Options Outside of Wilderness

Can this situation be resolved by action outside of wilderness?

Examples that might be explored include:

Putting up nest boxes outside wilderness boundaries.
Surveying visitors about user conflicts at the trailhead or visitor center, rather than on the trail or at their wilderness campsite
Locating trail destination and distance signs can be located at trailheads outside wilderness (unless already determined by agency policy).
Locating monitoring or other administrative structures outside wilderness.

E. Wilderness Character

How would action contribute to the preservation of wilderness character, as described by the components listed below?

Section 2(a) of the Wilderness Act directs us to manage wilderness areas for the preservation of their wilderness character. Similar direction is repeated in Section 4(b). It is recommended that particular attention is paid to the general guidance in the Wilderness Act, as outlined in the boxes on Page 2 of the

Overview, and to agency policy. In addition, at least four major components of wilderness character are mentioned in Section 2(c) of the Wilderness Act. These are:

"**Untrammeled**" – Wilderness is ideally unhindered and free from modern human control or manipulation.

"**Undeveloped**" – Wilderness has minimal evidence of modern human occupation or modification.

"**Natural**" – Wilderness ecological and evolutionary systems are substantially free from the effects of modern civilization.

"**Outstanding opportunities for solitude or a primitive and unconfined type of recreation**" – Wilderness provides opportunities for people to experience natural sights and sounds, solitude, freedom, risk, and the physical and emotional challenges of self-discovery and self-reliance.

This list of wilderness character components is not comprehensive. Other components can be defined that are of particular importance and reflect the character of your wilderness. An example of an action altering wilderness character is:

Taking management action to control invasive weeds might increase naturalness, while at the same time, greater manipulation of the wilderness decreases the untrammeled character of the area; the presence of employees and use of equipment to control invasive weeds may decrease visitor's opportunities for solitude in certain sections of this wilderness.

F. Describe Effects to the Public Purposes of Wilderness

How would action support the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Identify which of these public purposes would be degraded or enhanced by administrative action. For example:

If a main trail bridge is not replaced, it may affect recreation since the stream is otherwise impassable most of the year

A secondary trail bridge makes travel easier for only a short time of year, and therefore not replacing it may not significantly impact recreation.

Scientific activities may be accomplished by limited visits to the area by researchers instead of a research installation.

Step 1 Decision: Is it necessary to take action? Evaluate the responses made to all questions in Step 1 and determine whether there is a need to proceed to Step 2. If the responses indicate potential adverse impacts from taking action, document whether there is sufficient reason to proceed to Step 2.

Step 2: Determine the minimum tool.

Description of Alternative Actions

For each alternative, describe what methods and techniques will be used, when the action will take place, where the action will take place, what mitigation measures are necessary, and the general effects to wilderness character.

The description of alternatives and effects varies by the complexity of the action. Identify and describe a full range of feasible alternatives, including necessary mitigation measures that represent the various actions, and the methods and tools that could be used. Include a "No Action" alternative to allow for a comprehensive comparison of effects Complete a form for each alternative action being considered.

Compare the potential effects of each alternative on wilderness character by describing the effects of implementation using the criteria below This list is not all-inclusive, and other criteria which address the special features or unique character of each wilderness should be developed as needed. Use the criteria for comparing the effects of each applicable phase of the action including design, construction, management, removal, or restoration.

Alternative Comparison Criteria

Biological and Physical Resource

Describe the potential for protection, impairment, or restoration of natural conditions (air, water, soil, wildlife, fish, plants, etc.) including endangered, threatened, or rare species, natural biological diversity, and self-regulating ecosystems

Discuss effects related to protecting natural conditions within the regional landscape (i.e. insects, disease, or non-native species).

Social and Experiential Resource

Identify how opportunities for visitors to experience solitude or a primitive and unconfined type of recreation will be protected or impaired.

Describe the effects on wilderness character that will be noticeable to the visitor.

Heritage and Cultural Resource

Describe any effects on protection or management of historic, pre-historic, listed or eligible items, sites, structures, or landscapes.

Maintaining Contrast and Unimpaired Character

Identify any trend in wilderness management decisions that could be cumulative and cause impairment of wilderness character over time.

Explain how the alternative helps provide a contrast between wilderness and other areas where humans and their work dominate the landscape.

Determine if there will be effects that will prevent the wilderness from remaining unimpaired for the future use and enjoyment as wilderness.

Special Provisions

Explain how the special provisions and rights (grazing, mining, water developments, access to non-federal land, etc.) identified in the Wilderness Act (Sections 4 and 5) or subsequent legislation, are managed to minimize degradation of wilderness character

Safety of Visitors, Personnel, and Contractors and Work Methods

Describe any safety concerns associated with implementing the alternative on agency personnel, volunteers, and/or contractors.

Identify any potential public safety hazards resulting from implementation of the alternatives.

Discuss use of primitive and traditional skills and tools.

Economic and Time Constraints

Describe the costs and the amount of time it will take for implementation of the alternative.

Explain how each alternative satisfies any significant timing requirements or identified need for urgency.

Additional Wilderness-specific Comparison Criteria

Identify any other decision factors that are relevant to the unique characteristics and special features of this wilderness.

Step 2 Decision: What is the Minimum Tool?

Select the alternative that represents the minimum requirements necessary to administer the areas as wilderness.

Describe the rationale for selecting it.

Describe management requirements for minimizing effects including location, timing, frequency of action, design standards, etc. List any maintenance, monitoring, or reporting requirements. To aid in tracking and reporting the number and type of authorizations, check the box for each Section 4(c) use that is included in the selected alternative.

MINIMUM REQUIREMENTS DECISION GUIDE WORKSHEETS

Arthur Carhart National Wilderness Training Center

". . . except as necessary to meet minimum requirements for the administration of the area for the purpose of this Act..."

– The Wilderness Act, 1964

Step 1: Determine if it is necessary to take action.

Briefly describe the situation that may prompt action:

The situation that may prompt action in the Stephen T. Mather Wilderness is the implementation of a Mountain Lakes Fishery Management Plan/Environmental Impact Statement (plan/EIS). The draft plan/EIS considers a range of management alternatives, which include fish stocking and removal of reproducing populations of fish in select mountain lakes. The following section describes the purpose and need for the draft plan/EIS, and the existing conditions that may prompt administrative action in the Stephen T. Mather Wilderness.

The purpose of the draft plan/EIS is to guide management actions by the NPS and WDFW in mountain lakes that would:

- Conserve native biological integrity;
- Provide a spectrum of recreational opportunities and visitor experiences, including sport fishing;
- Resolve the long-standing debate and conflicts over fish stocking in the naturally fishless mountain lakes in North Cascades National Park, Ross Lake National Recreation Area, and Lake Chelan National Recreation Area (which together make up the "North Cascades National Park Service Complex")

Need:

NPS fishery management actions are governed by various relevant laws, regulations, and policies. In most NPS units, natural resources (including lakes and fish) are managed in accordance with the *Organic Act of 1916* and in concert with *NPS Management Policies* (NPS 2001a) and *Director's Order 12:* Conservation Planning, Environmental Impact Analysis, and Decision Making and Handbook, which allow sport fishing unless it is specifically prohibited, and prohibit stocking in most NPS waters (NPS 2001a, 4.4.3 and 8.2.2.5).

In the North Cascades Complex, fish have historically been managed by a combination of agencies and user groups. This is partly because the enabling legislation for the North Cascades Complex does not define the angling activities that were to be allowed within its boundaries, and partly because the area has a history of fish management by the state of Washington and sport fishing groups. This history of fish management predates the 1968 establishment of the North Cascades Complex by many years (see "History of Fish Management in North Cascades Mountain Lakes" in the "Background" section of the "Purpose of and Need for Action" chapter of the draft plan/EIS for more information on the North Cascades Complex enabling legislation).

The lakes that are the focus of the draft plan/EIS are the 91 mountain lakes in the North Cascades Complex that were naturally fishless, but have had some history of fish stocking since the late 1800s. The Stephen T. Mather Wilderness portion of the North Cascades Complex encompasses all of the lakes (except Thunder Lake) under consideration in the draft plan/EIS.

Existing Conditions:

Approximately 1000 anglers per year fish in the mountain lakes in the Stephen T. Mather Wilderness. The lakes are naturally fishless. In order to maintain a viable mountain lakes fishery for these anglers, some of the mountain lakes are stocked periodically by the Washington Department of Fish and Wildlife and their approved representatives. The Washington Department of Fish and Wildlife and various user groups advocate allowing fish stocking to continue in order to maintain the mountain lakes sport fishery.

Past stocking efforts have created reproducing, self-sustaining populations of nonnative fish in 37 lakes in the Stephen T. Mather Wilderness. Research demonstrates that these self-sustaining populations of fish can overpopulate the lakes and cause a variety of ecological effects. These effects include predation and competition with native organisms, and the potential for downstream dispersal and hybridization with native fish populations.

Administrative Actions analyzed in this Minimum Requirements Analysis:

The administrative actions of fish stocking and fish removal in the Stephen T. Mather Wilderness are considered in this analysis. Fish stocking would involve placing hatchery produced, nonreproducing trout in select mountain lakes. Methods for transporting stocked fish would include hand stocking via backpack access, and stocking by air with fixed wing aircraft. Fish removal would include various means of removing reproducing fish populations from select lakes. Fish removal would involve mechanical methods such as gillnetting combined with electrofishing and blocking access to spawning grounds in lakes with very limited spawning habitat. Fish removal would also involve application of the piscicide antimycin. The draft plan/EIS also considers a passive or "natural" method of fish removal that simply involves stopping the ongoing practice of stocking certain lakes that do not contain reproducing populations of fish. Since ceasing to stock as a means of removing fish does not involve administrative action in the Stephen T. Mather Wilderness, it is not considered in this analysis. Fish stocking and fish removal are considered separately in the following sections of this Minimum Requirement Analysis because they have different consequences for wilderness resources and the wilderness experience.

A. Describe Valid Existing Rights or Special Provisions of Wilderness Legislation

Are there valid existing rights or is there a special provision in wilderness legislation (the Wilderness Act of 1964 or subsequent wilderness laws) that allows consideration of action involving Section 4(c) uses? Cite law and section.

Yes: ☒ **No:** ☒ **Not Applicable:** ☐

Explain:

Valid Existing Rights: There is disagreement between the Washington Department of Fish and Wildlife and the National Park Service over the degree of jurisdictional authority to stock waters in the national park portion of North Cascades Complex. For the purpose of this analysis, it is asserted that this issue is not subject to existing rights. The basis for this assertion is the NPS interpretation of the enabling legislation and legislative history for the North Cascades Complex.

Special provision in legislation (the 1964 Wilderness Act or subsequent laws), that allows this project or activity:

Fish Stocking: There is no provision in the enabling legislation, the Wilderness Act, or the Washington Park Wilderness Act that explicitly allows for fish stocking.

Fish Removal: There is no provision in the enabling legislation, the Wilderness Act, or the Washington Park Wilderness Act that explicitly allows for fish removal. However, as an administrative unit of the National Park System, the North Cascades Complex is governed by the National Park Service Organic Act (39 Stat. 535, codified at 16 U.S.C. sections 1 through 4), which prohibits the NPS from allowing impairment of park resources or values. Thus, the NPS would have the authority to remove fish from wilderness lakes if their presence has the potential to impair park resources or values.

B. Describe Requirements of Other Legislation

Do other laws require action?

Yes: ☒ **No:** ☐ **Not Applicable:** ☐

Explain:

Provisions of the NPS Organic Act (39 Stat. 535, codified at 16 U.S.C. sections 1 through 4), and the Redwood National Park Expansion Act, as amended (92 Stat. 166, codified at 16 U.S.C. 1a-1), prohibit NPS from taking any action that may potentially impair park resources and values. For a complete description of other related laws, see appendix D of the draft plan/EIS.

C. Describe Other Guidance

Does taking action conform to and implement relevant standards and guidelines and direction contained in agency policy, unit and wilderness management plans, species recovery plans, tribal government agreements, state and local government and interagency agreements?

Yes: ☒ **No:** ☒ **Not Applicable:** ☐

Fish Stocking: Stocking of naturally fishless lakes in the National Park portion of the Stephen T. Mather Wilderness violates current NPS management polices regarding stocking of nonnative fish into national park waters. However, NPS policies do allow for stocking of nonnative fish into national recreation areas under certain circumstances (see section below entitled "NPS Management Policies 2001" and appendix D).

Fish Removal: The removal of nonnative populations of fish from lakes in both the park and national recreation areas would conform to NPS management policies. Fish removal would also conform to the terms of the 1985 MOU between the NPS and WDFW regarding fish and wildlife management provided that the NPS consults with the WDFW before taking any action (see section below entitled "MOU Between the NPS and WDFW" and appendix A).

Explain:

NPS Management Policies (2001)

NPS Management Policies instruct park units to:

> Maintain as part of the natural ecosystems of parks all native plants and animals by minimizing human impacts on native plants, animals, populations, communities, and ecosystems, and the processes that sustain them (NPS 2001a, 4.4.1).
>
> Reestablish natural functions and processes in human-disturbed components of natural systems in parks (unless otherwise directed by Congress) (NPS 2001a, 4.1.5). (Human disturbances include the introduction of exotic species and the disruption of natural processes. Using the best available technology and within its staff, funding and other resource constraints, park units are to restore the biological and physical components of these systems.)
>
> Seek to return human-disturbed areas to the natural conditions and processes characteristic of the ecological zone in which the damaged resources are situated" (NPS 2001a, 4.1.5).
>
> Allow recreational uses in wilderness that enable the areas to retain their primeval character and influence; protect and preserve natural conditions; leave the imprint of man's work substantially unnoticeable; provide outstanding opportunities for solitude or primitive and unconfined types of recreation; and preserve wilderness in an unimpaired condition (NPS 2001a, 6.4.3).
>
> Evaluate recreational uses --particularly new and emerging uses-- that compromise the stated purposes and definitions of wilderness or unduly impact the wilderness resource or the visitor experience within wilderness, to determine if these uses are appropriate, or should be limited or disallowed (NPS 2001a, 6.4.3.1).

Sport fishing is generally allowed in NPS units unless specifically prohibited, providing it "does not jeopardize natural aquatic ecosystems or riparian zones" (NPS 2001a, 8.2.2.5). At least one-third of the areas administered by the NPS have substantial fish resources and fishery activities. Sport fishing has been permitted in national parks since the establishment of Yellowstone National Park in 1872. Sport fishing is managed under 36 CFR 2.3, which states in part, "fishing shall be in accordance with the laws and regulation of the State . . . Nonconflicting State laws are adopted as part of these regulations." The NPS is allowed to restrict fishing activities wherever needed to achieve its own management objectives.

In contrast to sport fishing, the practice of stocking fish is generally prohibited in park units. Stocking cannot "impair park natural resources or processes," and it must take place only in national recreation areas or preserves that have historically been stocked (only the same species that has historically been stocked may continue to be stocked) (NPS 2001a, 4.4.3). Exotic species cannot displace native species (if displacement can be prevented), and parks are to manage "up to and including eradication" if control is feasible and the exotic species interferes with native species, natural habitats, or disrupts the integrity of the native species (NPS2001a, 4.4.4.2). If an exotic species is introduced or maintained to meet specific NPS management needs, all "feasible and prudent measures to minimize the risk of harm" to native biota or invasion of habitat by the exotic species must be taken, and the exotic species must "be known to be historically significant, to have existed in the park during the park's period of historical significance, or to have been commonly used in the local area at that time (NPS 2001a, 4.4.4.1)."

For more information regarding NPS Management Policies, refer to appendix D of the draft plan/EIS.

Memorandum of Understanding between the NPS and WDFW

To resolve differences in policy and to foster a spirit of cooperation, the NPS and WDFW negotiated a series of agreements beginning in 1979 that allowed stocking to continue in selected lakes in the North Cascades Complex. Currently, the management of mountain lakes is performed under a temporary extension of the 1985 Memorandum of Understanding and 1988 Supplemental Agreement between the two agencies. The Memorandum of Understanding and Supplemental Agreement (see appendix A for copies of both documents) were written "to continue cooperative efforts in management of protection and enhancement of the fisheries and wildlife resources of mutual concern." The Memorandum of Understanding provided "Statements of Work" (or directives) for both the NPS and the WDFW. The three main management directives from the Memorandum of Understanding that, in part, pertain to fish management are:

1. To consult with the Department [WDFW] prior to initiating research projects or implementing plans, programs, or regulations affecting fish and wildlife species distribution, numbers, or public use of fish and wildlife found within areas administered by the Service [NPS].

2. To practice those forms of management which will benefit fish and wildlife, and their habitats, and to maintain or restore their natural and historic distribution and abundance, consistent with the respective Service [NPS] policies and park objectives.

3. To permit the harvest of fish and wildlife in accordance with applicable state laws and regulations of the Department [WDFW] in those areas under the jurisdiction of the Service [NPS], which are open to hunting and/or fishing. It is recognized that some park regulations may vary for management purposes.

D. Describe Options Outside of Wilderness

Can this situation be resolved by action outside of wilderness?

Yes: ☐ **No:** ☐ **Not Applicable:** ☒

Explain:

Only one lake in the study area is outside of wilderness boundaries within the North Cascades Complex (Thunder Lake). There are hundreds of fishable lakes outside of the North Cascades Complex boundaries located within surrounding National Forests, but most of these lakes are also within wilderness boundaries. The NPS would not have authority to take actions outside its boundaries. In addition, some anglers who desire continued sport fishing believe that sport fishing in North Cascade lakes is a recreational opportunity that cannot be duplicated elsewhere.

E. Wilderness Character

How would action contribute to the preservation of wilderness character, as described by the components listed below?

Yes: ☒ **No:** ☒ **Not Applicable:** ☐

- **"Untrammeled"** – Wilderness is ideally unhindered and free from modern human control or manipulation.
- **"Undeveloped"** – Wilderness has minimal evidence of modern human occupation or modification.
- **"Natural"** – Wilderness ecological and evolutionary systems are substantially free from the effects of modern civilization.
- **"Outstanding opportunities for solitude or a primitive and unconfined type of recreation"** – Wilderness provides opportunities for people to experience natural sights and sounds, solitude, freedom, risk, and the physical and emotional challenges of self-discovery and self-reliance.

Untrammeled:

Stocking naturally fishless lakes, even with nonreproducing trout, would not leave the wilderness "ideally unhindered and free from modern human control or manipulation." Stocking of fish would manipulate the native ecology of a lake and introduce a nonnative species for the purpose of enhancing recreation.

Fish removal would also entail short-term human control or manipulation, with the objective of reestablishing sustainable native ecological conditions. Over the long term, removal of self-sustaining populations of trout would reestablish the untrammeled nature of the wilderness character by reducing evidence of human manipulation (e.g., nonnative fish) in lakes.

Undeveloped:

Development of the wilderness would not occur under any of the alternatives.

Natural:

Stocking with nonreproducing trout would temporarily affect the natural character of naturally fishless lakes in wilderness by introducing a nonnative species, thus manipulating the ecological structure of the lakes.

Removal of self-sustaining populations of nonnative fish would help to reestablish and conserve the biological integrity in naturally fishless lakes.

Following removal of reproducing populations, two of the alternatives propose to restock some of the lakes with nonreproducing fish as a means of continuing to provide sport fishing opportunities while minimizing impacts to biological integrity associated with reproducing populations of fish. Restocking, however would have minor to moderate adverse impacts to native biota over the long-term, and would provide no substantive benefits to the natural character of naturally fishless lakes within the wilderness.

Outstanding opportunities for solitude or a primitive and unconfined type of recreation:

Fish stocking would provide approximately 500 to 1,000 anglers per year with the opportunity to fish and have a wilderness experience while doing so. Fish stocking, the presence of anglers, fishing tackle left inadvertently behind, and other evidence of this human activity may impact the opportunities for solitude for some visitors who seek a wilderness experience within the North Cascades Complex.

Removal of reproducing populations of fish would take many years. During this time, some anglers and nonanglers would experience removal activities such as helicopters flights, motorized equipment use and the routine presence of field crews in limited areas of the wilderness. These activities would adversely affect opportunities for solitude and other elements of the wilderness experience for some wilderness users.

Other unique components that reflect the character of this wilderness:

Some anglers have reported through the EIS public scoping process that fishing the mountain lakes in the Stephen T. Mather Wilderness is a unique wilderness experience cannot be duplicated elsewhere. They cite the ruggedness of the terrain and the remoteness of the mountain lakes as providing outstanding opportunities for a wilderness experience while fishing within the North Cascades Complex.

F. Describe Effects to the Public Purposes of Wilderness

How would action support the public purposes for wilderness (as stated in Section 4(b) of the Wilderness Act) of recreation, scenic, scientific, education, conservation, and historical use?

Explain:

Fish stocking would continue to enhance recreational opportunities (sport fishing) in natural mountain lakes for approximately 1,000 anglers per year who use the wilderness area. Stocking and sport fishing have been a historic use of the area for several generations prior to the wilderness area's establishment. Stocking of nonreproducing trout in a scientifically informed manner using adaptive management principles would minimize impacts to the scientific and conservation purposes of wilderness. However, various elements of the scientific and conservation purposes of wilderness would remain compromised to some degree because the lakes were naturally barren of fish. For example, some of the mountain lakes would no longer provide scientists with the opportunity to study the ecology of naturally fishless mountain lakes because the lakes would contain nonnative fish.

Removal of self-sustaining populations of trout would best protect the scientific and conservation purposes of wilderness because removal would help to conserve biological integrity by reestablishing fishless conditions. Following removal, it is assumed that ecological structure of the lakes would revert to naturally fishless conditions although this could take many years. However, removal of reproducing populations of fish would reduce the recreational opportunities for a wilderness experience for some anglers because there would be fewer lakes available for fishing.

Following removal of reproducing, self-sustaining populations of trout, restocking of some lakes with nonreproducing populations of trout, as proposed in two alternatives, would support the recreational and historical use purposes of the wilderness area while minimizing impacts to biological integrity.

Step 1 Decision: Is it necessary to take action?

Yes: ☒ **No:** ☒ **Not Applicable:** ☐

Explain:

Fish Removal: Yes. Given the well-documented impacts of nonnative, reproducing populations of fish on native organisms, the NPS believes it is imperative to remove, wherever feasible, populations of reproducing trout from naturally fishless lakes. The draft plan/EIS concludes that if reproducing populations remained in the lakes, over time there would be major adverse impacts to native biota. Therefore, removal of reproducing, self sustaining populations of fish is required for administration of the area as wilderness in spite of the short term impacts to the wilderness experience that will occur during fish removal.

Fish Stocking: No. Stocking non reproducing trout into the high mountain lakes would continue to benefit the recreational wilderness experience for certain wilderness anglers. Stocking, however, would adversely impact the wilderness experience for other wilderness users. Fish stocking would also adversely impact, to varying degrees, the scientific, conservation and natural purposes of wilderness. If stocking were discontinued, opportunities for fishing in the high mountain lakes would be severely limited. However, various opportunities for sport fishing would remain in the rivers and streams, and other types of primitive and unconfined forms of recreation would still exist in the Steven T. Mather Wilderness. Therefore, the NPS believes that fish stocking is not required for administration of the area as wilderness.

If action is necessary, proceed to Step 2 to determine the minimum tool for action.

Step 2: Determine the minimum tool.

Description of Alternative Actions

For each alternative, describe what methods and techniques will be used, when the action will take place, where the action will take place, what mitigation measures are necessary, and the general effects to wilderness character.

Alternative # B, C, and D

Description:

Fish removal methods under alternatives B, C, and D would include mechanical, natural and chemical methods.

Mechanical methods would include gillnetting in combination with electrofishing and cobbling over of spawning grounds to break the cycle of reproduction.

Natural methods would be a passive means of eliminating fish by stopping stocking.

Chemical methods would be limited to application of the piscicide Antimycin to lakes larger than 5 acres in size where removal of fish using mechanical methods would probably not be feasible.

For a complete description of methods and mitigation, see the "Alternatives" chapter of the draft plan/EIS.

Effects:

Natural methods would have a beneficial effect on wilderness character for some wilderness users because stocking would cease and there would be less evidence of human manipulation of wilderness. For those who enjoy fishing in mountain lakes, there would be a loss of fishing opportunity and this would have an adverse impact on their wilderness experience.

Mechanical methods would have long-term beneficial impacts on mountain lakes by reestablishing historically fishless conditions. However, intensive use of gillnets and electrofishing equipment would also impose a variety of adverse, short-term impacts to wilderness character in limited areas of the wilderness. These impacts would include:

- Periodic use of helicopters to transport heavy equipment to lakes undergoing fish removal. Reduced opportunities for solitude in limited areas of the wilderness due to the short-term, seasonal presence of crews and mechanized equipment at select lakes undergoing fish removal.

- Some nontarget taxa would be inadvertently harmed or killed by gillnets. Although individual members of the population would be harmed, these adverse impacts would not be expected to affect the populations of nontarget taxa.

- Mechanical methods would only be feasible for removing reproducing populations of fish from small, shallow lakes. They would not be effective on larger deeper lakes.

Chemical methods would be limited to application of the piscicide antimycin in larger, deeper lakes with reproducing and self-sustaining populations of fish that could not be removed using mechanical methods.

The impacts of chemical methods would be similar to that of mechanical methods in many respects. For example, helicopters would be periodically needed to ferry heavy equipment to select lakes each season. In addition, field crews would be present at lakes undergoing treatment for several weeks at a time. Overall, field crews would not need to spend as much time at lakes undergoing antimycin treatment compared to lakes undergoing mechanical treatment, because antimycin treatment would remove fish more rapidly than mechanical treatment.

Application of antimycin would require use of motorized inflatable boats and other mechanized forms of equipment that would not be necessary for mechanical treatment.

Antimycin application would impact different forms of nontarget taxa compared to gillnetting. Impacts to nontarget taxa would be limited to those taxa most sensitive to antimycin, such as certain aquatic invertebrates. Nontarget taxa such as mammals and birds would not be affected by antimycin, whereas some individuals could be harmed or killed by gillnet entrapment.

Application of the piscicide antimycin in wilderness waters would offend some wilderness enthusiasts who would not support the use of pesticides in wilderness, the objective of fish removal, or both.

A comprehensive description of the impacts of fish removal on wilderness resources and values is provided in the "Environmental Consequences" chapter of the draft plan/EIS.

Step 2 Decision: What is the Minimum Tool?

The selected alternative is: (To be implemented prior to management action)

Describe the rationale for selecting this alternative:

Describe any monitoring and reporting requirements:

Please check any Wilderness Act Section 4(c) uses approved in this alternative:

- ☐ mechanical transport
- ☐ motorized equipment
- ☐ motor vehicles
- ☐ motorboats
- ☐ landing of aircraft
- ☐ temporary road
- ☐ structure or installation

Be sure to record and report any authorizations of Wilderness Act Section 4(c) uses according to agency procedures.

Approvals	Signature	Name	Position	Date
Prepared by:				
Recommended:				
Recommended:				
Approved by:				

WASHINGTON DEPARTMENT OF FISH AND WILDLIFE COMMENTS ON THE MINIMUM REQUIREMENTS ANALYSIS

The Washington Department of Fish and Wildlife (WDFW) appreciates the opportunity to work closely with National Park Service (NPS) staff in the development of the *Draft Mountain Lakes Fishery Management Plan / Environmental Impact Statement* (plan/EIS) for the North Cascades National Park Service Complex, and overall, we are generally satisfied with its technical content, and the responses to our technical comments and resultant revisions. The WDFW has carefully reviewed this appendix K. We were unable to find any mention of fish stocking in the *Wilderness Act*, including 4(c), where prohibited activities are defined. Our interpretation of the minimum requirements under the Act was that it would be applied to proposed prohibited activities. We now understand that it is NPS policy that requires any management action in wilderness administered by the NPS to undergo a Minimum Requirements Analysis (MRA). The WDFW expects that NPS will include additional text in their EIS to clarify this with citations.

With regard to the MRA on fish stocking itself, WDFW contends that the perspective brought forth in the following argument leads us to conclude that some limited, biologically based stocking of nonreproducing trout is necessary for the administration of the Stephen T. Mather Wilderness, and the NPS conclusion reached in Step 1 of the MRA regarding fish stocking should be reversed.

A fishery management program that is biologically based on limited stocking of nonreproducing trout would continue to provide high lakes recreational angling in park waters where fish stocking and wilderness angling are longstanding historical practices, while excessively reproducing fish populations in park high lakes are removed. Such a program would facilitate opportunities for angler education on conservation issues and reduce the risks of unsanctioned introductions of fish. Such a fishery management program has already been determined by the analyses documented in the EIS to conserve biological integrity of park lakes and their biota, leaving no permanent evidence of human presence and allowing natural processes to prevail.

Detailed comments on sections of the Worksheets for the MRA follow:

Section A. While there is no provision in the park's enabling legislation or the *Wilderness Act* that explicitly allows for fish stocking, there are also no provisions prohibiting it. Fish stocking itself does not fall under the 10 prohibitions defined in 4(c) of the *Wilderness Act*. Therefore, we believe very strongly that all analysis of *Fish Stocking* per se is unnecessary and inappropriate in sections A through F of the Worksheets. However, we fully agree with the need for an MRA for the *Fish Removal* aspect of the fishery management plan since the use of aircraft would likely be required. Aircraft use in wilderness is one of the prohibited uses noted in section 4c. WDFW believes the correct response for Section A is "Not Applicable" for fish stocking, although we reiterate that WDFW believes the correct approach is to not consider fish stocking as part of the MRA. The overall effects of fish stocking are more than adequately treated in the body of the EIS. Further, WDFW asserts that backpack stocking methods are the minimum tool for administering the stocking element of the fishery management plan, and backpack stocking of low numbers of trout fry has a minimal to undetectable impact.

Section D. As noted earlier, WDFW believes the MRA should not be applied to fish stocking per se. However, WDFW would answer "No" to this question. Too many, if not most, users of the remote, off-trail fish-bearing lakes in the wilderness fishery within the North Cascades Complex are unique, and suggesting "action" (stocking) in other wilderness areas is not applicable, and diminishes the value and importance of the North Cascades high-lake fishery. Within the Park, there are no lakes outside the Stephen T. Mather Wilderness that could be stocked to recreate the current opportunity, either in quality or quantity. WDFW, working cooperatively with NPS staff, has already greatly reduced the historic extent of the stocked trout fishery in the wilderness lakes, as fully described in the body of the EIS. (For fish removal, the answer to this question is obviously ‘No,” and WDFW supports the removal of the problem fish populations.)

Section E. WDFW recognizes that naturally barren lakes are not completely free from human manipulation if they harbor introduced fish, even low numbers of nonreproducing fish. However, WDFW has worked diligently over the past several decades and more recently with NPS technical staff to develop a responsible, biologically based fish stocking program that conserves biological integrity. A great deal of research now supports the premise that low numbers of nonreproducing fish can occupy certain lakes without causing significant deviations, or in some cases, even detectible changes in the structure or function of native high-lake ecosystems. These lakes show little evidence of human modification and are substantially free from the effects of modern civilization. Moreover, they still provide outstanding opportunities for solitude and primitive and an unconfined type of recreation, particularly a North Cascades wilderness fishing experience that cannot be met outside of the Park. Stocking effects are minor and temporary, and the periodic and dispersed nature of this fishery is unlikely to have major impacts on wilderness experience. Again, WDFW believes fish stocking should not be part of the MRA but is in agreement with the NPS analysis of the effects of fish removal on wilderness character.

Section F. With regard to the effects of fish stocking to the public purpose of wilderness, WDFW not only views fish stocking as an enhancement of the North Cascades Complex high-lake fishery, but as the fundamental support of this long-standing historic fishery, given the fact that WDFW agrees that most of the excessively reproducing fish populations in park high lakes should be removed. In providing this fishery, WDFW also places great value on the close relationship it has developed with the backcountry angling community. This relationship fosters ongoing efforts to educate anglers on conservation issues such as bull trout, amphibians, and the importance of biological integrity to high-lakes ecology. WDFW believes these efforts promote conservation throughout wilderness areas and reduce the likelihood of unsanctioned spread of nonnative fish species in wilderness areas. While scientific opportunity to study fishless ecosystems may be diminished in some individual lakes, there are still many such lakes where these opportunities exist. Opportunities to study recovery will also emerge as a collaborative and successful fish removal program moves forward. Moreover, the presence of low densities of nonreproducing fish does provide research opportunity for the study of how this important management approach affects native lake biota.

These points lead WDFW to the conclusion that fish stocking is the primary means by which this long-standing historical fishery is supported without significantly impacting other uses and, therefore, meets the minimum requirements for administering the Stephen T. Mather Wilderness.

Conclusion. WDFW does not believe fish stocking is a needed, or an appropriate, part of the Minimum Requirements Analysis because it is not prohibited under the *Wilderness Act*, and the paragraph on *Fish Stocking* should be removed from the MRA. However, we clearly agree that fish removal that uses any of the prohibited uses or actions within wilderness (such as aircraft use) requires the MRA, and that fish removal should occur in the agreed-upon lakes. Since park policy requires an MRA on all proposed activities, then the conclusion regarding fish stocking should be that limited, biologically based stocking of nonreproducing trout is necessary for the administration of the Stephen T. Mather Wilderness.

Minimum Tool. WDFW supports the use of helicopters as described in the body of the EIS to enable those fish removal projects requiring aircraft support. We are not aware of any other need to use any of the “10 Prohibited Uses” listed in section 4c of the *Wilderness Act*.

Canada
Mt. Baker Wilderness
Mt. Shuksan
North C
Nationa
(north
Baker Lake
Skagit River
Marblemount
Sauk River
Suiattle River
Darrington
Boulder River Wilderness
0
5
10
20

Appendix L

FINTROL LABEL AND APPLICATION INSTRUCTIONS

APPENDIX L: FINTROL LABEL AND APPLICATION INSTRUCTIONS

FINTROL CONCENTRATE
PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals

DANGER: Fatal if swallowed. May be fatal if absorbed through skin. Causes substantial but temporary eye injury. Causes skin irritation. Do not breath spray mist. Do not get in eyes, on skin or on clothing. Wear protective goggles. Wear chemical gloves. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash before reuse.

Environmental Hazards
This product is very highly toxic to fish
Physical or Chemical Hazards

Extremely Flammable: Keep away from fire, sparks and heated surfaces.

FIRST AID: IF SWALLOWED: Call a physician or Poison Control Center. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. If person is unconscious, do not give anything by mouth and do not induce vomiting.

IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IF ON SKIN: Wash with plenty of soap and water. Get medical attention.

IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Get medical attention.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

Storage: Store only in original containers, in a dry place inaccessible to children and pets. Fintrol Concentrate will thicken if stored at temperatures below 65 F. Before use store overnight above 70 F. Fintrol Concentrate is stable for a minimum of 3 years when stored in unopened original glass bottles.

Pesticide Disposal: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container Disposal: Triple rinse (or equivalent). Then dispose of in a sanitary landfill or by other approved state and local procedures.

RESTRICTED USE PESTICIDE

Due to Aquatic Toxicity & Need for Highly Specialized Applicator training. For retail sale to, and use only by, Certified Applicators, or persons under their direct supervision, and only for those uses covered by the Certified Applicators' Certification.

FINTROL®-

CONCENTRATE (ANTIMYCIN A)
FISH TOXICANT KIT
(contains Fintrol Concentrate and Fintrol Diluent)

This can contains 1 bottle of FINTROL-Concentrate and 1 bottle of Fintrol-Diluent.

FINTROL CONCENTRATE (8 fl. Oz.)		
Active Ingredients		
Antimycin A	23%	w/w
Inert Ingredients		
Soy lipids	15%	
Acetone	62%	
	100%	w/w

FINTROL DILUENT (8 fl. Oz.)		
Inert Ingredients		
Diethyl Phthalate (surfactant)	30.5%	w/w
Nonoxyl-9 (detergent)	16.7%	
Acetone	52.8%	
	100.0%	w/w

AQUABIOTICS CORP. P.O. BOX 10576. Bainbridge Island, WA 98110
E.P.A. Reg. No 39096-2 E.P.A. Est. No 39096-WA-01

DANGER ☠ POISON

Keep out of reach of children
See side panel for other Precautionary Statements.

DIRECTIONS FOR USE
It is a violation of federal law to use this product in a manner inconsistent with its labeling.
See "USE DIRECTIONS LEAFLET" for "Fintrol (Antimycin A) Fish Toxicant Kit"

FINTROL DILUENT
PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals

CAUTION: Harmful if swallowed. Harmful if inhaled. Harmful if absorbed through skin. Causes moderate eye irritation. Avoid contact with skin and clothing. Do not breath spray mist. Do not get in eyes, on skin or on clothing. Wear protective goggles. Wear chemical gloves. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash before reuse.

Physical or Chemical Hazards

EXTREMELY FLAMMABLE: KEEP AWAY FROM FIRE, SPARKS AND HEATED SURFACES.

FIRST AID

IF SWALLOWED: Call a physician or Poison Control Center. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. If person is unconscious, do not give anything by mouth and do not induce vomiting.

IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.

IF ON SKIN: Wash with plenty of soap and water. Get medical attention.

IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Get medical attention.

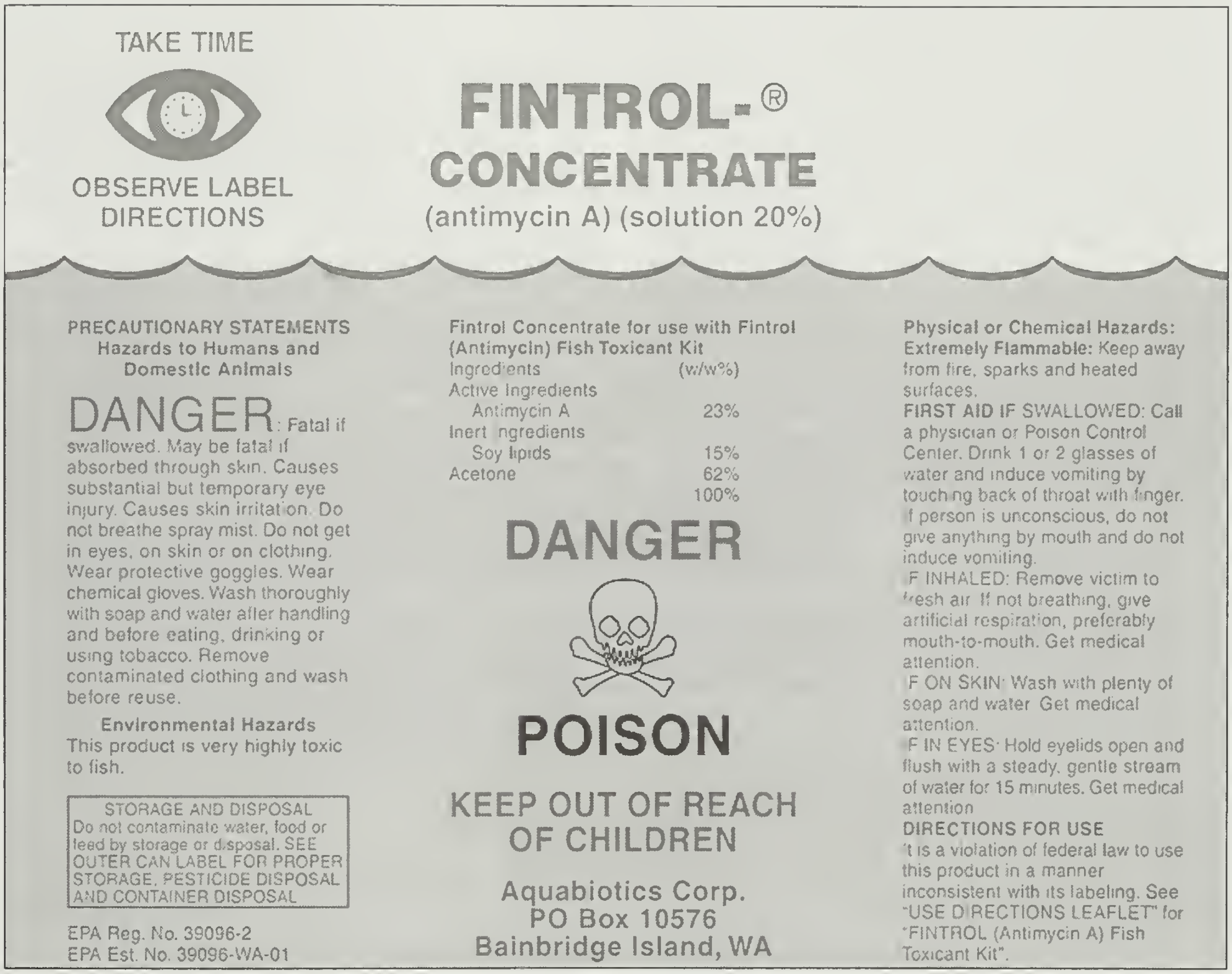
STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

Storage: Store only in original containers, in a dry place inaccessible to children and pets. Fintrol Concentrate will thicken if stored at temperatures below 65 F. Before use store overnight above 70 F. Fintrol Concentrate is stable for a minimum of 3 years when stored in unopened original glass bottles.

Pesticide Disposal: Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your state pesticide or environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

Container Disposal: Triple rinse (or equivalent). Then dispose of in a sanitary landfill or by other approved state and local procedures.



TAKE TIME

OBSERVE LABEL DIRECTIONS

FINTROL-®
CONCENTRATE
(antimycin A) (solution 20%)

PRECAUTIONARY STATEMENTS
Hazards to Humans and Domestic Animals

DANGER: Fatal if swallowed. May be fatal if absorbed through skin. Causes substantial but temporary eye injury. Causes skin irritation. Do not breathe spray mist. Do not get in eyes, on skin or on clothing. Wear protective goggles. Wear chemical gloves. Wash thoroughly with soap and water after handling and before eating, drinking or using tobacco. Remove contaminated clothing and wash before reuse.

Environmental Hazards
This product is very highly toxic to fish.

STORAGE AND DISPOSAL
Do not contaminate water, food or feed by storage or disposal. SEE OUTER CAN LABEL FOR PROPER STORAGE, PESTICIDE DISPOSAL AND CONTAINER DISPOSAL

EPA Reg. No. 39096-2
EPA Est. No. 39096-WA-01

Fintrol Concentrate for use with Fintrol (Antimycin) Fish Toxicant Kit

Ingredients	(w/w%)
Active Ingredients	
Antimycin A	23%
Inert Ingredients	
Soy lipids	15%
Acetone	62%
	100%

DANGER

POISON

KEEP OUT OF REACH OF CHILDREN

Aquabiotics Corp.
PO Box 10576
Bainbridge Island, WA

Physical or Chemical Hazards:
Extremely Flammable: Keep away from fire, sparks and heated surfaces.
FIRST AID IF SWALLOWED: Call a physician or Poison Control Center. Drink 1 or 2 glasses of water and induce vomiting by touching back of throat with finger. If person is unconscious, do not give anything by mouth and do not induce vomiting.
IF INHALED: Remove victim to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth. Get medical attention.
IF ON SKIN: Wash with plenty of soap and water. Get medical attention.
IF IN EYES: Hold eyelids open and flush with a steady, gentle stream of water for 15 minutes. Get medical attention.
DIRECTIONS FOR USE
It is a violation of federal law to use this product in a manner inconsistent with its labeling. See "USE DIRECTIONS LEAFLET" for "FINTROL (Antimycin A) Fish Toxicant Kit".

FINTROL®

Fish Toxicant Kit

Use Direction Leaflet

Directions For Use

It is a violation of Federal Law to use this product in a manner inconsistent with its labeling.

FINTROL-CONCENTRATE is designed for use in running water, streams and shallow waters. This liquid form of FINTROL may be applied to lakes and ponds by boat bailer method or spray equipment. Spray methods are useful at depths to 1 foot. Boat bailer and drip tubes, applied at the propeller wash, are used at other depths. Application from an airplane is NOT recommended.

Each can of Fintrol-Concentrate (Antimycin A) Fish Toxicant Kit [containing 240 cc. Fintrol-Concentrate (solution 20%) and 240 cc. Diluent] will, after mixing, make 480 cc., which treats approximately 38 acre-feet of water at 1 p.p.b. (1 part per billion).

AQUABIOTICS CORP.
P.O. Box 10576
10750 Arrow Point Dr. NE
Bainbridge Island, WA 98110

EPA Reg. No. 39096-2
EPA Est. No. 39096-WA-01

Licensed by: Wisconsin Alumni Research Foundation

Trademark licensed by: Ayerst Laboratories, Inc.

Before applying FINTROL to either public or private waters, contact the Director of the State Fish and Game Department or Conservation Department for State and Federal regulations governing the use of fish toxicants in your area.

DESCRIPTION

The active ingredient of FINTROL is antimycin A. When absorbed through the gills of fish, antimycin A kills by interfering with the respiration of body cells. Antimycin A does not repel fish. This is an important advantage, particularly when running waters, bog lakes, and the epilimnion, or upper layer, of large lakes are treated. Fish make no attempt to escape contact with the toxicant by seeking to move into waters that are clear of it. FINTROL'S action is rapid and Irreversible.

Sensitivity to FINTROL varies widely among fish species. Hence it may be employed to selectively destroy certain species, without affecting other species concurrently inhabiting the same body of water.

Sensitive:

Gizzard shad, trouts, pikes, carp, minnows, suckers,
brook stickleback, white bass, sunfishes, perches,
freshwater drum, sculpins.

Least Sensitive:

Shortnose gar, bowfin, goldfish, catfish.

FINTROL also may be used to selectively destroy certain age groups of species; younger fish are more sensitive to FINTROL.

Providing the concentration is correctly estimated, FINTROL can be used effectively at any time of year in either cold, warm, soft, hard, acid, alkaline, clear or turbid (muddy) waters. (See TABLE 1 and Instruction for bioassay.)

FINTROL does not impart detectable taste or odor to treated waters. In the usual, recommended concentrations it causes no apparent harm to aquatic plants, insects, or bottom fauna. Since FINTROL'S active ingredient degrades rapidly, the reclaimed waters may be restocked soon after treatment. **(See HOW TO DETERMINE WHEN TREATED WATER MAY BE RESTOCKED.)** There is very little interruption in availability of the waters for recreational, agricultural, industrial, or other purpose.

USES

FINTROL is used to cull undesirable species of fish from freshwater lakes, ponds, and streams. It can be used to eliminate all fish from a body of water (complete kill). Or, it can be used to remove only certain fish species or size groups from mixed populations (selective kill).

A **complete kill** may be achieved with a concentration of anywhere from 5 to 25 p.p.b. of active ingredient. **(See HOW TO DETERMINE THE MOST EFFECTIVE CONCENTRATION.)** FINTROL is particularly advantageous for complete kills because it detoxifies so rapidly the pond can usually be restocked in about a week, or as soon as caged fish survive 48 hours' exposure to the treated waters.

Under optimal circumstances, in ponds managed for sports fishing, **selective kills** may be achieved at concentrations as low as 0.5 to 1.0 p.p.b. However, because these concentrations are extremely low, there is no rule of thumb that can be relied upon to determine them accurately. A BIOASSAY IS ALWAYS REQUIRED TO PINPOINT THE OPTIMAL CONCENTRATION FOR SELECTIVE KILLS. (Literature describing this procedure is available upon request.)

A **selective kill** has these advantages: It can be made without interrupting sport fishing for more than a week or so, and fishing may be gradually improved without restocking. In the past, when bluegill, minnows, or green sunfish dominated a pond managed for bass, the usual solution to the problem was the total removal of all the fish with a fish toxicant. This meant restocking and little or no fishing for one or two years. Now — with FINTROL — this is no longer necessary. Low concentrations of FINTROL will affect small bluegill, green sunfish, and minnows primarily. Only a few of the very small bass will succumb. The bulk of the adult bluegill and green sunfish will not be affected. Thus FINTROL helps to bring about a balanced relationship between the bass and bluegill populations. This improves fishing without interrupting it for any appreciable length of time.

In **catfish farming** FINTROL can be used to *selectively eliminate* the trash fish (scale fish) that commonly reduce the yields and increase the costs of the commercial catfish farmer. It is possible to do this with FINTROL because concentrations that will eliminate scale fish generally will not harm adult catfish. The scale fish most often encountered by the catfish farmer will succumb to anywhere from 5 to 10 p.p.b. of active ingredient (See TABLE 1) whereas, under ordinary circumstances, it takes in excess of 20 p.p.b. to kill catfish. (Caution should be exercised during stress conditions of unusually high water temperature and reduced oxygen content when the sensitivity of fishes to chemicals may increase.)

HOW TO SELECT THE APPROPRIATE FORMULATION

The nature of the water to be treated (its depth and rate of flow) and the character of the surrounding land are factors to be taken into consideration when determining the formulation of FINTROL to employ in a given situation.

HOW TO DETERMINE THE MOST EFFECTIVE CONCENTRATION

For complete kills and also,
for removal of scale fish from catfish ponds.

The concentration of antimycin A required to kill one or more species of fish in any given body of water depends upon: 1) the sensitivity of the species to be eradicated, and 2) the chemical and physical properties of the water at the time of application of the toxicant; the pH and the temperature of the water are the most important of these chemical and physical factors under ordinary circumstances. Therefore, to determine what concentration of antimycin A will be required to kill the undesirable fish in your pond or lake:

1) identify the species to be eradicated,
2) determine the pH and average water temperature by measuring at various sites and depths,
3) refer to TABLE 1 for approximate concentrations.
4) conduct a bioassay to pinpoint the optimal concentration.

TABLE 1 provides a rough estimate of the concentrations required for a **complete kill** under various environmental conditions. However, since water chemistry is subject to sudden alteration by many variables and often unpredictable factors (pollution, heavy algae bloom, weather, drawdown, etc.) it should be realized that such changes may affect the performance of the toxicant. For this reason, measurements of pH and water temperature should always be taken as close to the time of treatment as is feasible.

TABLE 1—FOR ROUGH ESTIMATION OF CONCENTRATIONS* OF FINTROL (ANTIMYCIN A) NEEDED FOR COMPLETE† ERADICATION OF DIFFERENT FISH SPECIES, UNDER VARIOUS COMBINATION OF WATER TEMPERATURE AND WATER pH

TARGET SPECIES	SENSITIVITY OF TARGET SPECIES TO FINTROL (in p.p.b. of active ingredient)	EFFECTIVE CONCENTRATION OF FINTROL* (in p.p.b. of active ingredient)			
		When pH is 8 5 or less		When pH is 8 5 or more	
		water temperature above 60⁰F.	water temperature below 60⁰F	water temperature above 60⁰F.	water temperature below 60⁰F
gizzard shad trouts pikes carp minnows suckers brook stickleback white bass sunfishes perches freshwater drum sculpins	5-10	5	7.5	7.5	10
short nose gar bowfin goldfish catfish	15-25	15	20	20	25

***The concentration level suggested by this table should be confirmed by an on-site bioassay.**

† This table is applicable only when a *complete* kill is desired. Do not use it for a selective kill. (See the following section.)

* Fish nomenclature according to American Fisheries Society

Note (columns 1 and 2) that the sensitivity of the target species determines the concentration range. To eradicate sensitive species, it is recommended that the appropriate formulation at FINTROL be applied so that the body of water will have a concentration of from 5 to 10 p.p.b. of antimycin A, depending upon variation in pH and water temperature. For more tolerant species, higher concentrations are recommended Laboratory Studies indicate that less sensitive fish will succumb at concentrations of from 15 to 25 p.p.b of antimycin A, depending upon variations in pH and water temperature Columns 3 to 6 show how to adjust for pH and water temperature Note that, in general, the lower the pH, the less FINTROL required. The higher the water temperature, the less FINTROL required. The ideal situation for a complete kill would combine a highly sensitive species, low pH and high water temperature.

For selective kills in ponds managed for sports fishing

The only way to determine the concentration of FINTROL needed for a selective kill is to perform a bioassay. This involves subjecting both the target and nontarget fish to several concentrations of FINTROL to determine the minimum lethal dose. (A description of the bioassay procedure is available upon request.)

HOW TO CALCULATE THE AMOUNT OF FINTROL TO BE ADDED TO A BODY OF WATER TO OBTAIN A GIVEN CONCENTRATION

To calculate the amount of FINTROL to be added to a body of water for eradication of undesired species, the following steps should be taken:

- Determine the volume of water to be treated in acre-feet. This can be arrived at by multiplying the surface area in acres by the average depth in feet.
- Determine the concentration to be used from Table 1.
- Multiply the number of acre-feet by the value given in Table 2, opposite the desired concentration.
- Divide this number by the total kit volume (480 cc. or 16 oz) to get number of Fish Toxicant Kits needed.

TABLE 2—RAPID ESTIMATION OF FINTROL-CONCENTRATE REQUIREMENTS

Desired Concentration (p.p.b. active ingredient)	Amount of FINTROL-CONCENTRATE per acre-foot	
	cc*	oz.(approx.)
1 p.p.b	12.3	½
2 p.p.b.	24.6	¾
3 p.p.b.	36.9	1¼
4 p.p.b.	49.2	1½
5 p.p.b.	61.5	2
6 p.p.b.	73.8	2½
7 p.p.b.	86.1	2¾
8 p.p.b.	98.4	3¼
9 p.p.b.	110.7	3¾
10 p.p b.	123.0	4

*Obtained by multiplying 12 3 cc. by the p p b

Note. 1 measuring teaspoon = 5 cc.; 1 measuring tablespoon = 15 cc.; ¼ standard measuring cup = 60 cc.; ½ standard measuring cup = 120 cc.; 1 standard meas cup = 240 cc

Sample calculation:

To treat 75 acre-feet at 3 p.p.b., use:

75 x 36.9 cc = 2,767 cc. of FINTROL-CONCENTRATE / 480 cc = 5 8 Kits, or

75 x 1¼ fl. oz. = 93¾ fl oz of FINTROL-CONCENTRATE / 16 oz = 5 8 kits)

METHODS OF APPLICATION

IMPORTANT: DURING APPLICATION OF FINTROL, ALL PERSONS IN THE IMMEDIATE VICINITY SHOULD WEAR PROTECTIVE GOGGLES AND PROTECTIVE GLOVES

Liquid formulation: Directions for mixing: Add the Diluent [blue label] to the FINTROL CONCENTRATE (solution 20%) [Green label] in the oversize mixing container. Cap tightly and invert 2 to 3 times to mix thoroughly. Further dilute with AT LEAST five (5) gallons of water to insure that the acetone contained in FINTROL-CONCENTRATE will not affect rubber parts on any equipment that might be used to apply it. After water has been added, apply within eight (8) hours. [Note: The solution obtained by mixing the Diluent with FINTROL-CONCENTRATE (solution 20%) retains potency for up to seven (7) days. But once water has been added to this solution, it must be used within eight (8) hours to ensure potency.]

After appropriate dilution with water, the liquid formulation of FINTROL can be applied to lakes and ponds by the boat bailer method or spray equipment. Spray methods are useful at depths to one foot. Boat bailer and drip tubes when applied at the propeller wash are useful at greater depths. Pinpoint applications to shoal areas and small, isolated ponds can readily be made with backpack sprayers. (See CAUTION on use of PROTECTIVE GOGGLES AND PROTECTIVE GLOVES.)

In streams, FINTROL-CONCENTRATE is most often applied through drip stations established to meter the toxicant at a precalculated rate. Information on the use of such equipment may be obtained from state and/or federal agencies, experienced in stream treatment.

It is recommended that all applications of FINTROL be made at daybreak or as soon as there is enough light to work by.

PRECAUTIONS

Fish killed with antimycin A should not be consumed by man or animals. Treated waters must not be used for drinking by man or animals, or for crop irrigation, until fingerling rainbow trout or fingerling bluegills survive 48 hours' exposure in livecars in the treated waters.

Leftover portions of mixed liquid formulation retain potency for up to seven (7) days. But once water has been added to FINTROL-CONCENTRATE, it must be used within eight (8) hours to ensure potency.

Due to its acetone component, FINTROL-CONCENTRATE is flammable: keep away from heat and flame.

HOW TO DETERMINE WHEN TREATED WATER MAY BE RESTOCKED

Since antimycin A degrades rapidly following application, waters can usually be restocked about one week following treatment with FINTROL. Place livecars containing a sensitive species of fish in the treated water. It is recommended that these fish be fingerling rainbow trout or fingerling bluegills if the water temperature is between 35° and 68° F. When the water temperature exceeds 68° F, only fingerling bluegills should be used. If the fish survive for 48 hours, the water may be restocked.

HOW TO DETOXIFY FINTROL WITH POTASSIUM PERMANGANATE ($KMnO_4$)

If it should be necessary to detoxify FINTROL in the outflow of a pond to prevent killing fish downstream, apply potassium permanganate at 1 part per million (1 p.p.m.) to the outflow. (More potassium permanganate may be needed if the stream has a high permanganate demand). Drip systems of hose-and-clamp or carburetor types can be employed to continuously dispense a solution of potassium permanganate into the water at the discharge outlet.

To evaluate the effectiveness of the detoxification process, place livecars containing fingerling rainbow trout or fingerling bluegills approximately 100 yards downstream from the site of $KMnO_4$ introduction. The water is considered detoxified if the fish survive for at least 48 hours in the livecar.

To detoxify FINTROL-treated streams, apply $KMnO_4$ at 1 p.p.m. at detoxification stations. (More $KMnO_4$ may be needed if the stream has a high permanganate demand). Continue the application of $KMnO_4$ until all FINTROL-treated water has passed the station. The water may be considered detoxified when fingerling rainbow trout or fingerling bluegills survive for at least 48 hours in livecars placed 100 yards downstream from the site of potassium permanganate ($KMnO_4$) introduction.

RE-ENTRY STATEMENT

Do not allow swimming in, drinking, or irrigation with FINTROL (Antimycin) treated water until a livecar of sensitive species of fish (fingerling rainbow trout or bluegill) survive for 48 hours in the treated waters. (See statement of How To Determine When Treated Water May Be Restocked).

SPECIAL INSTRUCTIONS

Prior to the use of a fish toxicant in either public or private waters, the Director of the State Fish and Game Department or Conservation Department must be contacted to determine whether a permit is required. Such products must be used by or under the technical supervision of personnel of state and federal fish and game agencies, trained in fisheries management, who will provide any special instructions applicable to the particular geographical area.

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Appendix M

Shoreline Cover Types
Around the 91 Lakes
in the Study Area

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APPENDIX M: SHORELINE COVER TYPES AROUND THE 91 LAKES IN THE STUDY AREA

The statistics for shoreline cover types shown in table M-1 were calculated by on-screen digitizing shoreline distance of cover types using 1:12000 black and white Digitial Orthophoto Quads. 1:12000 color photos were analyzed in stereo (3-D) for additional interpretation. Cover types include forest, shrub, meadow, talus, bedrock, and cliff. If "cliff" was identified as the type, no other cover was specified; for example, if there was a bedrock cliff, it was just labeled cliff and not bedrock. Cover type values are percentages of the total perimeter for each lake.

The analyses presented in the "Special Status Plant Species" and "Vegetation" sections in the "Environmental Consequences" chapter used the information in table M-2 as a guide in determining the level of impacts on the two impact topics (resource categories).

TABLE M-1: SHORELINE COVER TYPES AROUND THE 91 LAKES IN THE STUDY AREA

Lake Name[a]	NPS Lake Code	Vegetation Zone	Percent of Shoreline Cover					
			Forest	Shrub	Meadow	Talus	Bedrock	Cliff
Azure Lake	MP-09-01	Alpine	0	12	2	31	0	55
Battalion	MLY-02-01	High Forest	9	39	20	32	0	0
Bear	MC-12-01	Subalpine	0	30	6	63	0	0
Berdeen	M-08-01	Subalpine	0	20	0	54	26	0
Berdeen, Lower	M-07-01	Subalpine	0	53	21	26	0	0
Berdeen, Upper	MR-09-01	Subalpine	0	63	7	30	0	0
Blum (Largest/Middle, No. 3)	M-11-01	Subalpine	0	47	0	53	0	0
Blum (Lower/West, No. 4)	LS-07-01	Subalpine	0	30	70	0	0	0
Blum (Small/North, No. 2)	MC-01-01	Subalpine	0	0	44	56	0	0
Blum #1 (Vista/Northwest, No. 1)	MC-02-01	Subalpine	0	37	14	49	0	0
Bouck, Lower	DD-04-01	High Forest	60	18	22	0	0	0
Bouck, Upper	DD-05-01	Subalpine	23	17	20	41	0	0
Bowan	MR-12-01	Subalpine	0	24	76	0	0	0
Coon	MM-10-01	Low Forest	29	13	58	0	0	0
Copper	MC-06-01	Subalpine	0	37	5	59	0	0
Dagger	MR-04-01	High Forest	3	36	60	0	0	0
Dee Dee, Upper	MR-15-01	Subalpine	0	14	6	80	0	0
Dee Dee/Tamarack, Lower	MR-15-02	Subalpine	16	29	39	16	0	0
Despair, Lower	M-14-01	Subalpine	0	43	0	57	0	0
Despair, Upper	M-13-01	Alpine	0	0	0	100	0	0
Diobsud No. 1	LS-01-01	High Forest	0	0	76	24	0	0
Diobsud No. 2, Lower	LS-02-01	High Forest	0	47	53	0	0	0
Diobsud No. 3, Upper	LS-03-01	Subalpine	0	24	76	0	0	0
Doubtful	CP-01-01	Subalpine	0	0	55	34	0	11
Doug's Tarn	M-21-01	Subalpine	10	53	29	7	0	0
East, Lower	MC-14-02	Subalpine	0	57	25	18	0	0
East, Upper	MC-14-01	Subalpine	0	0	12	88	0	0
Firn	MP-02-01	Subalpine	0	8	7	85	0	0
Green	M-04-01	Subalpine	0	71	10	19	0	0
Green Bench	LS-04-01	Alpine	0	0	9	13	78	0

TABLE M-1: SHORELINE COVER TYPES AROUND THE 91 LAKES IN THE STUDY AREA (CONTINUED)

Lake Name[a]	NPS Lake Code	Vegetation Zone	Percent of Shoreline Cover					
			Forest	Shrub	Meadow	Talus	Bedrock	Cliff
Hanging	MC-08-01	High Forest	20	14	8	58	0	0
Hidden	SB-01-01	Subalpine	0	30	2	69	0	0
Hidden Tarn	EP-14-01	Alpine	0	0	0	100	0	0
Hi-Yu	M-01-01	Subalpine	0	44	56	0	0	0
Hozomeen	HM-02-01	Low Forest	95	0	3	2	0	0
Ipsoot	LS-06-01	Subalpine	0	73	27	0	0	0
Jeanita	DD-01-01	High Forest	0	25	62	13	0	0
Kettling	MR-05-01	High Forest	60	35	0	5	0	0
Kwahnesum	MC-07-01	Subalpine	18	13	23	46	0	0
McAlester	MR-10-01	High Forest	57	9	29	5	0	0
Middle, Lower	MC-16-02	Subalpine	0	0	69	31	0	0
Middle, Upper	MC-16-01	Subalpine	0	0	14	86	0	0
Monogram	M-23-01	Subalpine	0	66	34	0	0	0
Monogram Tarn	M-23-11	Subalpine	NA[b]	NA	NA	NA	NA	NA
Nert	M-05-01	High Forest	0	35	53	0	0	12
Noisy Creek, Upper	LS-14-01	High Forest	0	39	61	0	0	0
No Name	PM-01-01	High Forest	5	58	37	0	0	0
Panther Potholes, Lower	RD-05-02	Low Forest	52	21	18	8	0	0
Panther Potholes, Upper	RD-05-01	Low Forest	0	37	34	30	0	0
Pegasus	EP-10-01	Alpine	0	37	0	63	0	0
Pond SE of Kettling Lakes	ML-09-01	Subalpine	0	69	8	23	0	0
Quill, Lower	M-24-02	Subalpine	0	38	30	33	0	0
Quill, Upper	M-24-01	Subalpine	0	0	50	50	0	0
Rainbow	MR-14-01	High Forest	24	33	42	0	0	0
Rainbow, Upper (North)	MR-13-01	Subalpine	0	38	33	29	0	0
Rainbow, Upper (South)	MR-13-02	Subalpine	0	8	18	74	0	0
Rainbow, Upper (West)	MM-11-01	Subalpine	0	13	16	60	11	0
Redoubt	MC-11-01	Subalpine	0	4	3	94	0	0
Reveille, Lower	MC-21-02	Subalpine	15	0	43	41	0	0
Reveille, Upper	MC-21-01	Subalpine	0	0	4	96	0	0
Ridley	HM-03-01	Low Forest	100	0	0	0	0	0
Sky	EP-13-01	Subalpine	0	37	0	63	0	0
Skymo	PM-03-01	Subalpine	0	28	14	58	0	0
Sourdough	PM-12-01	Subalpine	6	51	12	31	0	0
Sourpuss	ML-01-01	Subalpine	0	0	70	30	0	0
Stiletto	MR-01-01	Subalpine	0	42	0	58	0	0
Stout	EP-09-02	Subalpine	5	45	0	50	0	0
Stout, Lower	EP-09-01	Subalpine	0	35	55	10	0	0
Sweet Pea	ML-02-01	High Forest	0	23	10	35	0	31
Talus Tarn	M-06-01	Subalpine	0	0	10	90	0	0
Tapto, Lower	MC-17-03	Subalpine	0	16	22	63	0	0
Tapto, Middle	MC-17-02	Subalpine	0	58	42	0	0	0
Tapto, Upper	MC-17-01	Subalpine	0	28	10	62	0	0
Tapto, West	MC-17-04	Subalpine	0	15	85	0	0	0

TABLE M-1: SHORELINE COVER TYPES AROUND THE 91 LAKES IN THE STUDY AREA (CONTINUED)

Lake Name[a]	NPS Lake Code	Vegetation Zone	Percent of Shoreline Cover					
			Forest	Shrub	Meadow	Talus	Bedrock	Cliff
Thornton, Lower	M-20-01	High Forest	0	77	6	13	0	4
Thornton, Middle	M-19-01	Subalpine	0	5	0	82	0	13
Thunder	RD-02-01	Low Forest	42	42	15	0	0	0
Tiny	MC-15-01	Subalpine	0	0	50	50	0	0
Torment	ML-03-01	Subalpine	0	0	5	95	0	0
Trapper	GM-01-01	Subalpine	21	43	12	24	0	0
Triplet, Lower	SM-02-01	Subalpine	0	48	46	6	0	0
Triplet, Upper	SM-02-02	Subalpine	0	35	33	31	0	0
Triumph	M-17-01	Subalpine	0	7	21	72	0	0
Unnamed	FP-01-01	Alpine	0	0	0	100	0	0
Unnamed	MR-11-01	Subalpine	0	70	0	30	0	0
Unnamed	MR-16-01	Subalpine	0	57	43	0	0	0
Vulcan	ML-04-01	Subalpine	21	23	15	41	0	0
Wilcox/Lillie, Upper	EP-06-01	Subalpine	7	25	49	19	0	0
Wilcox/Sandie, Lower	EP-05-01	Subalpine	29	0	4	67	0	0
Wild	MC-27-01	Subalpine	0	0	60	40	0	0
Willow	HM-04-01	Low Forest	71	7	22	0	0	0

Notes:

a. Shaded rows indicate the 22 lakes that are in Ross Lake and Lake Chelan National Recreation Areas; the other 69 lakes are in the national park portion of the North Cascades Complex.

b. "NA" means that information on the shoreline cover type for the lake is not available.

TABLE M-2: SHORELINE COVER TYPES AND LEVEL OF VISITATION

This table corresponds with the backcountry overnight use visitation numbers in "Map 2 Table," the shoreline cover types in table M-1, and the management action codes for each lake from table 5 in the "Alternatives" chapter. The lakes in the same-colored rows mean those lakes occur in the same backcountry zone or camp (see "Map Table 2"). The "X" means the lake would or may have fish (depending on the applied management action).

Total estimated annual backcountry overnight use = 4,035

Level of Visitation: H = High (3,210), M = Medium (594), L = Low (231)

				Lakes That Have or May Have Fish				Percent of Shoreline Cover					
Lake Name	NPS Lake Code	Level of Visitation in 2003	Number of Visitors	Alt A	Alt B	Alt C	Alt D	Forest	Shrub	Meadow	Talus	Bedrock	Cliff
Doubtful	CP-01-01	H	**441**	**X**	**X**-2C	2A	2A	0	0	55	34	0	11
NRA-McAlester	MR-10-01	H	**372**	**X**	**X**-2B	**X**-2B	2A	57	9	29	5	0	0
NRA-Panther Potholes, Lower	RD-05-02	H	**342**	**X**	4A	4A	4A	52	21	18	8	0	0
NRA-Panther Potholes, Upper	RD-05-01	H		1	1	1	1	0	37	34	30	0	0
NRA-Coon	MM-10-01	H	**306**	**X**	**X**-4C	**X**-4C	4A	29	13	58	0	0	0
NRA-Hozomeen	HM-02-01	H	**280**	**X**	2A	2A	2A	95	0	3	2	0	0
NRA-Ridley	HM-03-01	H		**X**	**X**-4C	**X**-4C	4A	100	0	0	0	0	0
Copper	MC-06-01	H	**268**	**X**	**X**-4B	4A	4A	0	37	5	59	0	0
Dagger	MR-04-01	H	**221**	**X**	**X**-2B	2A	2A	3	36	60	0	0	0
Stiletto	MR-01-01	H		**X**	**X**-4B	4A	4A	0	42	0	58	0	0
Tapto, Lower	MC-17-03	H	**211**	1	1	1	1	0	16	22	63	0	0
Tapto, West	MC-17-04	H		1	1	1	1	0	15	85	0	0	0
Thornton, Lower	M-20-01	H	**203**	**X**	**X**-3C	3A	3A	0	77	6	13	0	4
Thornton, Middle	M-19-01	H		**X**	**X**-4C	4A	4A	0	5	0	82	0	13
Unnamed	FP-01-01	H	**193**	1	1	1	1	0	0	0	100	0	0
Pegasus	EP-10-01	H		1	1	1	1	0	37	0	63	0	0
NRA-Rainbow	MR-14-01	H	**132**	**X**	**X**-2C	**X**-2C	2A	24	33	42	0	0	0
NRA-Rainbow, Upper (North)	MR-13-01	H		1	1	1	1	0	38	33	29	0	0
NRA-Rainbow, Upper (South)	MR-13-02	H		**X**	4A	4A	4A	0	8	18	74	0	0
NRA-Rainbow, Upper (West)	MM-11-01	H		**X**	4A	4A	4A	0	13	16	60	11	0
NRA-Bowan	MR-12-01	H		**X**	4A	4A	4A	0	24	76	0	0	0
Vulcan	ML-04-01	H	**129**	1	1	1	1	21	23	15	41	0	0
Hidden	SB-01-01	H	**112**	**X**	**X**-3C	3A	3A	0	30	2	69	0	0
Hidden Lake Tarn	EP-14-01	H		**X**	4A	4A	4A	0	0	0	100	0	0

TABLE M-2: SHORELINE COVER TYPES AND LEVEL OF VISITATION (CONTINUED)

Lake Name	NPS Lake Code	Level of Visitation in 2003	Number of Visitors	Lakes That Have or May Have Fish				Percent of Shoreline Cover					
				Alt A	Alt B	Alt C	Alt D	Forest	Shrub	Meadow	Talus	Bedrock	Cliff
Monogram	M-23-01	M	**94**	X	X-2C	2A	2A	0	66	34	0	0	0
Monogram Tarn	M-23-11	M		X		4A	4A	4A	NA	NA	NA	NA	NA
Jeanita	DD-01-01	M	**92**	X	X-3B	3A	3A	0	25	62	13	0	0
Sourdough	PM-12-01	M		X	X-2B	2A	2A	6	51	12	31	0	0
Trapper	GM-01-01	M	**90**	X	X-3B	3A	3A	21	43	12	24	0	0
Tapto, Middle	MC-17-02	M	**64**	1	1	1	1	0	58	42	0	0	0
Tapto, Upper	MC-17-01	M		1	1	1	1	0	28	10	62	0	0
Doug's Tarn	M-21-01	M	**49**	X	X-2C	2A	2A	10	53	29	7	0	0
Quill, Lower	M-24-02	M		X	X-4B	4A	4A	0	38	30	33	0	0
Quill, Upper	M-24-01	M		X	X-4B	4A	4A	0	0	50	50	0	0
Triumph	M-17-01	M		X	X-4C	4A	4A	0	7	21	72	0	0
Despair, Lower	M-14-01	M		1	1	1	1	0	43	0	57	0	0
Despair, Upper	M-13-01	M		1	1	1	1	0	0	0	100	0	0
Berdeen	M-08-01	M	**48**	X	X-2C	2A	2A	0	20	0	54	26	0
Green	M-04-01	M		X	X-2B	2A	2A	0	71	10	19	0	0
Ipsoot	LS-06-01	M		X	X-3B	3A	3A	0	73	27	0	0	0
Berdeen, Lower	M-07-01	M		X	2A	2A	2A	0	53	21	26	0	0
Berdeen, Upper	MR-09-01	M		X	2A	2A	2A	0	63	7	30	0	0
Green Bench	LS-04-01	M		1	1	1	1	0	0	9	13	78	0
Nert	M-05-01	M		X	4A	4A	4A	0	35	53	0	0	12
Talus Tarn	M-06-01	M		1	1	1	1	0	0	10	90	0	0
Stout	EP-09-02	M	**45**	X	X-3B	3A	3A	5	45	0	50	0	0
Sky	EP-13-01	M		1	1	1	1	0	37	0	63	0	0
Stout, Lower	EP-09-01	M		X	X-3B	3A	3A	0	35	55	10	0	0
Wilcox/Lillie, Upper	EP-06-01	M		X	2A	2A	2A	7	25	49	19	0	0
Wilcox/Sandie, Lower	EP-05-01	M		X	X-2C	2A	2A	29	0	4	67	0	0
NRA-Dee Dee, Upper	MR-15-01	M	**38**	X	X-2B	2A	2A	0	14	6	80	0	0
NRA-Dee Dee/Tamarack, Lower	MR-15-02	M		X	4A	4A	4A	16	29	39	16	0	0

TABLE M-2: SHORELINE COVER TYPES AND LEVEL OF VISITATION (CONTINUED)

Lake Name	NPS Lake Code	Level of Visitation in 2003	Number of Visitors	Lakes That Have or May Have Fish				Percent of Shoreline Cover					
				Alt A	Alt B	Alt C	Alt D	Forest	Shrub	Meadow	Talus	Bedrock	Cliff
Blum (Largest/Middle, No. 3)	M-11-01	M		**X**	**X-2B**	2A	2A	0	47	0	53	0	0
Blum (Lower/West, No. 4)	LS-07-01	M		**X**	**X-2C**	2A	2A	0	30	70	0	0	0
Blum (Small/North, No. 2)	MC-01-01	M		1	1	1	1	0	0	44	56	0	0
Blum #1 (Vista/Northwest, No. 1)	MC-02-01	M		1	1	1	1	0	37	14	49	0	0
Azure Lake	MP-09-01	M	**37**	1	1	1	1	0	12	2	31	0	55
Diobsud, No. 1	LS-01-01	L	**34**	**X**	2A	2A	2A	0	0	76	24	0	0
Diobsud, No. 2, Lower	LS-02-01	L		**X**	**X-2B**	2A	2A	0	47	53	0	0	0
Diobsud, No. 3, Upper	LS-03-01	L		**X**	4A	4A	4A	0	24	76	0	0	0
Hi-Yu	M-01-01	L		**X**	**X-4B**	4A	4A	0	44	56	0	0	0
Noisy Creek, Upper	LS-14-01	L		1	1	1	1	0	39	61	0	0	0
NRA-Willow	HM-04-01	L	**32**	**X**	**X-4C**	**X-4C**	4A	71	7	22	0	0	0
Bear	MC-12-01	L	**30**	**X**	**X-2C**	2A	2A	0	30	6	63	0	0
East, Lower	MC-14-02	L		1	1	1	1	0	57	25	18	0	0
East, Upper	MC-14-01	L		1	1	1	1	0	0	12	88	0	0
Reveille, Lower	MC-21-02	L		1	1	1	1	15	0	43	41	0	0
Reveille, Upper	MC-21-01	L		1	1	1	1	0	0	4	96	0	0
Sweet Pea	ML-02-01	L	**28**	**X**	**X-4C**	4A	4A	0	23	10	35	0	31
Sourpuss	ML-01-01	L		1	1	1	1	0	0	70	30	0	0
Torment	ML-03-01	L		**X**	4A	4A	4A	0	0	5	95	0	0
Wild	MC-27-01	L	**26**	1	1	1	1	0	0	60	40	0	0
Redoubt	MC-11-01	L	**20**	1	1	1	1	0	4	3	94	0	0
Middle, Lower	MC-16-02	L	**13**	1	1	1	1	0	0	69	31	0	0
Middle, Upper	MC-16-01	L		1	1	1	1	0	0	14	86	0	0
Tiny	MC-15-01	L		1	1	1	1	0	0	50	50	0	0
NRA-Bouck, Lower	DD-04-01	L	**11**	**X**	**X-2C**	**X-2C**	2A	60	18	22	0	0	0
Bouck, Upper	DD-05-01	L		**X**	4A	4A	4A	23	17	20	41	0	0
NRA-Thunder	RD-02-01	L		1	1	1	1	42	42	15	0	0	0
NRA-Triplet, Lower	SM-02-01	L	**9**	**X**	**X-2C**	**X-2C**	2A	0	48	46	6	0	0
NRA-Triplet, Upper	SM-02-02	L		**X**	2A	2A	2A	0	35	33	31	0	0

TABLE M-2: SHORELINE COVER TYPES AND LEVEL OF VISITATION (CONTINUED)

Lake Name	NPS Lake Code	Level of Visitation in 2003	Number of Visitors	Lakes That Have or May Have Fish				Percent of Shoreline Cover					
				Alt A	Alt B	Alt C	Alt D	Forest	Shrub	Meadow	Talus	Bedrock	Cliff
Kettling	MR-05-01	L	**7**	**X**	2A	2A	2A	60	35	0	5	0	0
NRA-Pond SE of Kettling Lake	ML-09-01	L		**X**	**X**-4C	**X**-4C	4A	0	69	8	23	0	0
NRA-Unnamed	MR-16-01	L	**7**	**X**	**X**-3B	**X**-3B	3A	0	57	43	0	0	0
NRA-Unnamed	MR-11-01	L	**6**	**X**	**X**-4C	**X**-4C	4A	0	70	0	30	0	0
Hanging	MC-08-01	L	**5**	**X**	2A	2A	2A	20	14	8	58	0	0
Kwahnesum	MC-07-01	L		**X**	4A	4A	4A	18	13	23	46	0	0
Firn	MP-02-01	L	**3**	**X**	**X**-3B	3A	3A	0	8	7	85	0	0
No Name	PM-01-01	L		**X**	**X**-4C	4A	4A	5	58	37	0	0	0
Skymo	PM-03-01	L		**X**	**X**-2C	2A	2A	0	28	14	58	0	0
NRA-Battalion	MLY-02-01	L	**0**	**X**	**X**-2B	**X**-2B	2A	9	39	20	32	0	0

Management action codes at a glance

1	Fishless
2A / 3A	Remove fish
2B	Remove fish, evaluate, potentially restock
2C	Remove/restock
3B	Evaluate fish/allow low density
3C	Supplement by stocking
4A	Discontinue stocking
4B	Discontinue stocking, evaluate, potentially restock
4C	Continue to stock

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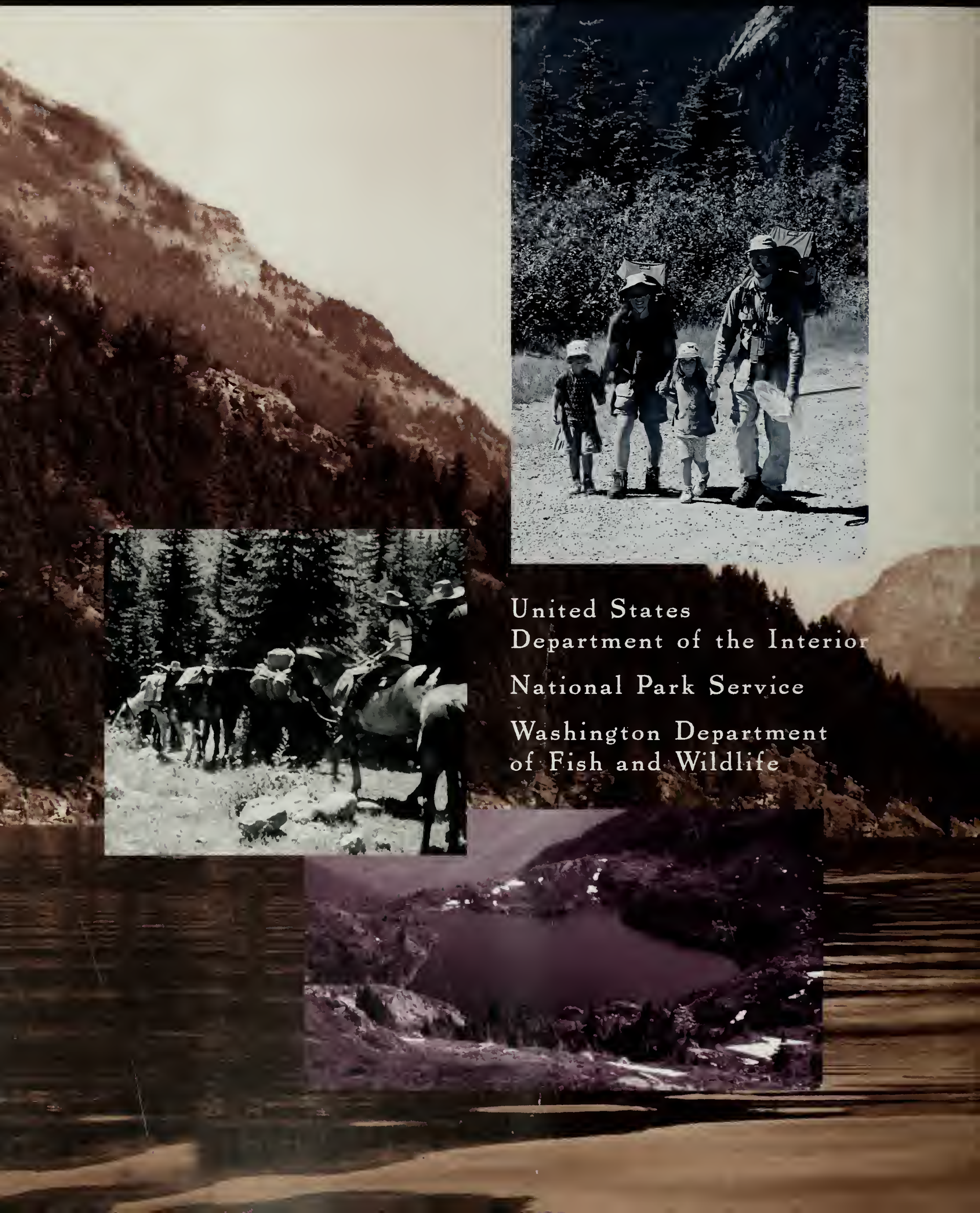

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